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Number 2,000

This week we publish the two-thousandth issue of the JOURNAL and no fewer than 1,772 have been produced under the present editorship. The JOURNAL came into existence in January, 1902, and continued as a monthly magazine until 1920, since when it has appeared weekly. It now takes about 20 feet of shelf space to accommodate a complete set of volumes. Though it has changed its size five times, the JOURNAL has fundamentally remained the same, in that it mirrors the development of the industry it services. It now reaches every corner of the world, and has to cater for the interest of the largest American concerns as well as, say, a jobbing shop in Mauritius. Every major development within the industry is covered, and browsing over back pages one finds constantly the resurrection of old ideas in slightly new form.

In the early days, just before and after the formation of the British Foundrymen's Association, considerable reference was made to foreign literature, as the output of domestic technical papers was too meagre to give adequate service to our industry. As the Association developed, finally to become the Institute of British Foundrymen, this country's quantative contribution to the technical literature of the industry materially expanded. Simultaneously, its standard improved, receiving very high appreciation in international circles. International criteria in the foundry industry are not an unknown quantity, as since 1926 world congresses have been held regularly, thus achieving a unique record in the history of technical co-operation.

Throughout its long history, the JOURNAL has fostered technical and, later, commercial co-operation. First there was the Institute itself, then came the "equipment" association, the Institute of Vitreous Enamellers, and more recently the National Society of Master Patternmakers; in addition, help was given in the launching of the British Cast Iron Research Association, the Council of Ironfoundry Associations and the Association of Bronze and Brass Founders. The most cherished testimonial we have ever received was a letter from a prosperous South African foundry which stated that the success of the firm was entirely due to information printed in the JOURNAL.

The career of the JOURNAL has not been very exciting, inasmuch that there have never been any spectacular advances or noteworthy declines. However, progress has been on virtually straight lines. It has not been greatly affected by either trade booms and depressions, possibly due to the fact that as the foundry caters for such a diversity of interests some sections are always kept reasonably busy. The future of the JOURNAL is obviously bound up with the industry, and the progress made by the latter during the last decade has laid solid foundations upon which to build. Founding no longer lags behind other industries in such important matters as research, equipment and enlightened personnel, indeed in some directions it leads. In its endeavours to progress, the industry will have in the future, as the past, every encouragement and help the JOURNAL can provide and we are sure that issue number 3,000 will afford proof of continuous and diligent work towards this end.

F

Dinner

WORSHIPFUL COMPANY OF FOUNDERS

The Livery Dinner of the Worshipful Company of Founders was held last Tuesday at the Mansion House, London, by courtesy of the Right Hon. the Lord Mayor. The function was presided over by the Master, Mr. F. Arnold Green. Accompanying him at the High Table were the Lord Mayor, Alderman H. W. Seymour Howard; the Master of the Grocers Company, Mr. E. F. O. Gascoigne; Sir Hugh Beavor; Brig.-General Sir Harold Hartley, F.R.S.; the Common Serjeant, Sir Anthony Hawke; the Dean of St. Pauls, the Very Reverend W. R. Mathews; Sir Niel Hamilton Fairley, F.R.S.; the president of the Institute of British Foundrymen, Mr. John Bell; Dr. Hugh Stannus (immediate past Master); Mr. N. V. Kenyon, L. C. C.; Dr. C. E. Sundell; Vice Admiral J. Hughes Hallett, C.B., D.S.O., M.P.; the president of the British Steel Founders Association, Mr. F. N. Lloyd; Alderman F. A. Hoare; Alderman Anthony G. Clifton Brown; Mr. A. L. Parrott; Mr. J. Foster Petrie; Mr. A. Stanley Young (past Master); Mr. Percy L. Young (past Master); Mr. Leonard J. Carpenter, A.R.I.B.A.; Sir Leslie Brass; Sir Thomas Lumley Smith; the curator of the Guildhall Library, Mr. Raymond Smith; the Master of the Dyers Company, Mr. B. P. Chambers; Capt. Vernon Donaldson, R.N.; Mr. Deputy Charles G. Dickson; Mr. W. G. Fossick, M.A. (past Master); Mr. J. Arthur Taylor (past Master) Mr. Austin S. Beech; Mr. L. C. H. Athill; Acting Commissioner of the Police for the City of London, Capt. H. P. Griffiths; Mr. T. O. Beachcroft; Sir Harold West; Mr. L. H. Corbould-Ellis, B.A. (past Master); the president of the Institution of Electrical Engineers, Mr. J. Eccles; Mr. Kenneth T. D. Thompson; the president of the Institution of Civil Engineers, Mr. David M. Watson; Mr. C. H. Everist; Reverend G. H. Salter; Mr. A. C. Jennings, M.A. (Upper Warden); Mr. J. Stephen Betts; Mr. Sheriff Leslie Prince, M.A.; Mr. Sheriff E. Calcott Price, O.B.E.; Mr. A. L. Binns; Mr. Henry Ginsburg; Mr. J. L. Everist and Mr. H. Wilson Wiley, M.A., the clerk of the company.

After dinner, an entertainment was given by Miss Marianne Juer and Mr. Geoffrey Robinson under the direction of Mr. Victor Marmont.

Mond Nickel Fellowships

The Mond Nickel Fellowships committee announces the following awards for 1954:—

Mr. M. Brownlee (Dorman, Long & Company, Limited, Redcar). To study British, Continental and American hot- and cold-metal basic open-hearth steel-making with particular reference to furnace design and construction, and factors affecting ingot quality.

Mr. R. D. Butler (Imperial Chemical Industries, Limited, Liverpool). To study mineral-dressing practice in Great Britain, on the Continent and in the U.S.A. and Canada, with particular reference to the design, layout and operation of small-scale mills.

Mr. F. B. Peacock (Dorman, Long & Company, Limited, Middlesbrough). To study rolling-mill operation and maintenance with particular reference to soaking pits, blooming mills and the production of universal beams, structural sections and rails.

Mr. A. M. Sage (British Iron and Steel Research Association, London). To study the manufacture and fabrication of structural steels in the United Kingdom, Europe, U.S.A. and Canada.

S.-g. Iron "On the Air"

Dr. A. B. Everest, F.I.M., of the Mond Nickel Company's Development and Research Department, will give a talk on s.-g. cast iron entitled "Cast Iron that Bounces and Bends" in the B.B.C. "Science Survey" series, at 10.30 p.m. on the Home Service on Thursday, January 6, 1955. There will be a repeat of this broadcast on Saturday, January 8, at 9.30 a.m. This new cast iron has already been the subject of a short television programme in the B.B.C. "Science Review" series and created considerable interest among viewers.

MOSCOW RADIO is reported to have announced that Soviet steel output this year has increased by 4,500,000 tons to 40,000,000 tons and that coal output has risen by 20,000,000 tons this year.

A.F.S. Progress

The annual report of the American Foundrymen's Society announces a record membership of 11,551 and 54 branches. During the year, it has built new offices at Golf and Wolf Roads, Des Plaines, Illinois, about 26 miles from Chicago. The building occupies 11,139 sq. ft. and is air-conditioned throughout. It contains a conference room, library and canteen, in addition to the normal office and storeroom accommodation. An exterior view of the building is reproduced in the accompanying illustration.

Runners and Risers

I.B.F., East Midlands' Short-paper Competition Entries

The East Midlands branch has contributed several papers in the past to the proceedings of the Institute of British Foundrymen on the subject of runners and risers. There is evidence in these new contributions—entries in a short-paper competition organized by the branch—that the precepts enunciated earlier have been followed and the work extended to include the findings of other research workers in the field. The two contributions reproduced respectively interpret patented runner designs and calculations of riser sizes.

Mathematically-designed Runner System to Eliminate Turbulence in Casting Cavity

By J. Aston

The "running system" described in this Paper was invented by Friederick Nielsen and is covered by British Patent No. 690,790, published April 29, 1953. A first endeavour will be to put the " patent terminology " into language understandable by foundrymen whether or not they are mathematically minded. This method of casting relates preferably to light metals, where turbulence in the casting cavity can cause areas of oxide inclusions and porosity in the resultant casting. Nielsen claims that only 6 to 25 per cent. or even less of the potential energy obtained from the height of fall in the downright is necessary to fill a casting cavity. His patent covers the " running system " from the bottom of the downright to the casting cavity.

Mathematically, the inventor proves two methods in use:—

(*a*) Choking the metal from the downgate to the casting cavity in the ratio 4:3:2 and other similar ratios.

(*b*) Increasing the cross-sectional area of the runner in the ratio 1:2.5:10 is not exactly incorrect, but the use of these ratios leads to a very " definite effect."

In the case of (*a*) the metal enters the casting cavity at more or less the same velocity as it has at the bottom of the downgate—this tends to give swirling and turbulence in the casting cavity (Fig. 1).

In order to make the calculations easier and clearer, the metal at the bottom of the downgate in Figs. 1, 2 and 3 has been assumed to have a speed of 100 m.p.h. In the case of (*b*), the increase in cross-sectional area is too great, with the result that the running system cannot be kept full of metal and hence excessive oxide-films are formed on the large metal-surfaces exposed (Fig. 2). The inventor achieves with his method " quiet " clean metal, by holding together the tip of the metal stream from the commencement of pouring, thus presenting the smallest possible free surface to the atmosphere in the mould.

Reduction of Kinetic Energy

Shock effects or other energy-consuming operations are used to reduce the kinetic energy of the metal entering the casting cavity. His object is achieved by changing the direction of flow of the metal at right angles a number of times and by increasing the cross-sectional area at each change in direction by a maximum of 60 per cent. In practice, he recommends a 33 per cent. increase in cross-sectional area. By using this system all the runner channels are kept filled with metal and the velocity of the metal entering the casting cavity is controllable. With a 90 deg. angle and an increase of 60 per cent. cross-sectional area, the velocity is decreased by about 37.5 per cent. at each change in direction. With a 33 per cent. increase in cross-sectional area the velocity is reduced by about 25 per cent. (Fig. 3).

Fig. 4 shows a plan of the running system. To obtain the maximum reduction in velocity from each change in direction the outside angle "A" should be kept as sharp as possible. The inside angles may be rounded more liberally. If the whole system were " streamlined " to make it a better moulding proposition, it would be necessary to increase the number of stages to achieve the same reduction in velocity. In this case, Fig. 4 would probably have to be changed to Fig. 5.

Dross Traps can be incorporated in the system if the correct relationship is maintained before and after the trap (Fig. 6); this type could also possibly be used for feeding purposes. Where the changes in direction are in a horizontal plane, it is preferable for the height of the runner channels to decrease towards the casting, thus the system incorporates its own dross traps. It should be noted that when cross-sectional area is mentioned, it is the *total* cross-sectional area of that stage in the system which is referred to, *e.g.*, if there are 12 ingates, it is the total cross-sectional area of these which constitutes a stage in the system.

Refinements Suggested

Nielsen suggests that, if possible, wherever a stage runs on a horizontal plane for a long distance, it should be inclined, so that an unbroken metal stream with the smallest possible surface-area is exposed to the atmosphere in the mould cavity. Fig. (a) is to be preferred to Fig. (b) in this respect. Another refinement to the system, used regularly in normal foundry practice, is to set back each stage of the runner from the end of the preceding stage (Fig. 8).

In the example shown in Fig. 9 (a), where there has been a 60 per cent. increase in area at every 90 deg. change in direction, it is wrong to have stage III running into stage IV (as shown in Fig. 11 (b)) unless either stages I, II and III have been

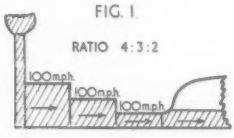
Runners and Risers

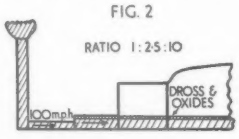
increased by 100 per cent. or the cross-sectional area of channel constituting stage IV has been decreased by 100 per cent., because the metal is then free to flow in two directions.

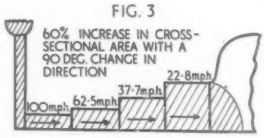
Proof Castings

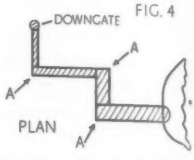
Up to the present time, only a limited number of test castings have been made to prove this running method and in all cases an aluminium alloy has been the metal used. In each case, the sand in the cope box was cut away above the casting cavity to enable the flow of the metal to be clearly viewed. The first casting made had a conventional runner (Fig. 10), the swirling action was clearly visible. The Nielsen technique was then adopted and a disc casting run, as shown in Fig. 11. The metal flowed quietly into the cavity without any sign of turbulence. A further disc was cast with four ingates as in Fig. 12, and still the metal showed no sign of turbulence. A wheel-shaped casting was next experimented with (Fig. 13). Once again there was no turbulence in the casting cavity. Even in the centre boss which was below the level of the spokes, the metal rose quietly.

Rectangular and other shaped castings, made with obstructions deliberately arranged and constrictions to the flow of metal, have been made with this new technique and in each case non-turbulent metal was obtained in the casting cavity.









FIGS. 1 TO 4.—*Running systems having various size ratios. In Fig.* 1, *turbulence is caused and in Fig.* 2, *excessive oxide films; Figs.* 3 *and* 4 *show the use of angles to reduce velocity.*

Rectangular and other shaped castings, made with obstructions deliberately arranged and constrictions to the flow of metal, have been made with this new technique and in each case non-turbulent metal was obtained in the casting cavity.

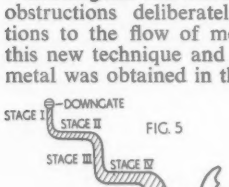


FIG. 5.—*A "streamlined" version to replace the system shown in Fig.* 4.

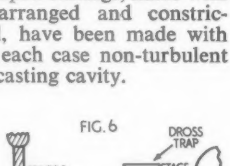


FIG. 6.—*Incorporation of a dross trap—this could also possibly be used for feeding purposes.*

Top Running

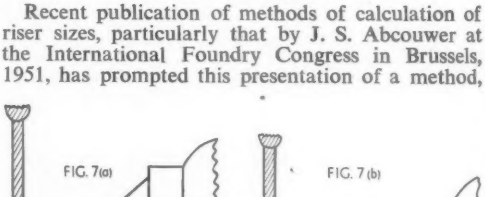
All the castings so far described have had the metal entering the casting cavity at the lowest point, however, as Nielsen suggests, much improvement could be gained if, in castings which are "top run," the metal reached the top edge of the castings at a very low initial speed, thus enabling the metal to be accurately directed and evenly distributed. This latter method of "running" is not often used in light-alloy foundry practice, but the compromise between "top" and "bottom" running, *i.e.*, joint running which is usually adopted would benefit if the metal left the ingates at a lower speed. This could be achieved if a Nielsen running system were placed on the joint of the mould. The horngate technique may also be adapted to this method (Fig. 14). This would possibly be of great use in the shell-moulding field.

Finally the Author would like to point out that, should this patented technique be adapted to "run" a particular casting which has been "run" by one of the conventional methods previously, it will be found that different chilling and feeding technique will have to be adopted to cope with the new conditions in the mould. If commercial castings are to be made with this method, it will, of course, be necessary to come to some agreement with the inventor.

Practical Method of Calculation of Riser Sizes

By B. Millington

Recent publication of methods of calculation of riser sizes, particularly that by J. S. Abcouwer at the International Foundry Congress in Brussels, 1951, has prompted this presentation of a method,



FIGS. 7 (*a*) AND (*b*).—*Runner systems in which the former is preferable to the latter, so as to expose an unbroken stream of metal to the cavity atmosphere.*

which, although it was derived in the first instance from theoretical considerations, is sufficiently simple for the average skilled moulder to use on jobbing work. As a background, it should be stated that the method was devised for the calculation of riser sizes for grey irons of 2.8 to 3.5 per cent. carbon content, although there appears to be no reason why other metals cannot be treated in a similar way.

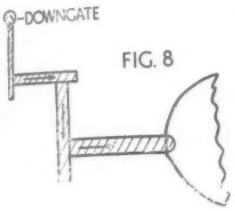
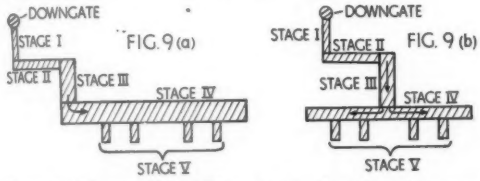


FIG. 8.—*Plan view of a system in which each stage of the runner is set back from the preceding stage.*

Basic Assumptions

The method is based on a consideration of cooling speeds for variously shaped bodies, and assumes that the cooling speed of a cast, flat plate is equal to that of a cylinder having a diameter equal to twice the thickness of the plate, the length in each case being infinite.

It is further assumed that the optimum shape of a riser is cylindrical, as a cylinder has a higher volume or weight : surface-area ratio and therefore a lower cooling speed than square, rectangular or oval forms. From the theoretical approach, a spherical form is even better, but the cost and inconvenience of moulding spherical risers limits the application of these to special cases.



FIGS. 9 (*a*) AND (*b*).—*Plan views showing the error of not having corresponding increases or decreases throughout a system.*

A casting does not always require a riser, as it may be cast in very high carbon-equivalent metal, or cast slowly through "pop"-gates, knife-edge gates or Connor feeders, etc. When, however, a riser is required, it should be placed on, or as near possible to, the thickest section of the casting, as, once the mould is full, this is the last portion to solidify, unless chills or other aids to preferential cooling are in use. The casting then solidifies back to the thickest section, and, provided that the gating system supplies hot metal to the riser and the riser is sufficiently large, the riser sets last of all and the casting is perfectly fed and uniformly sound.

This point about the gating system is made because it is possible to have a riser of more than adequate size and yet make an insufficiently-fed casting, if the gates are far enough from the riser and this receives the coldest metal in the mould. If it is impossible to gate through or near the riser, the riser must be filled with hot metal and covered with exothermic material. In this case, fast gating is advantageous, in order that the casting and riser are as nearly as possible at the same temperature.

Method Proposed

Bearing these considerations in mind, the riser diameter can be calculated directly from the thickness of the section which must be fed. The rule stated by the Author as standard is:—

$$D = 2T + 1 \text{ in.};$$

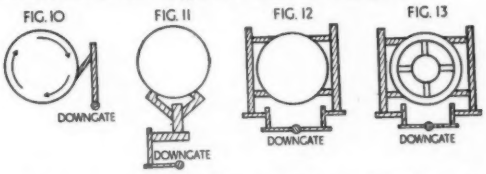
where D = diameter of riser, and T = section thickness.

This is based simply on the ratio of cooling speeds of a cylinder and a flat plate, and the 1 in. is added as a factor of safety to ensure that the riser cools more slowly than the casting. The rule is independent of casting temperature, composition, and number of risers, as it is used solely to ensure that solidification shrinkage does not occur in the casting due to the total solidification of the riser before that of the casting. The supply of the necessary amount of feed metal is a function of the volume of the riser and this will be discussed later.

The height, H, of the riser is calculated by the following rule:—

$$H \text{ (minimum)} = 1\tfrac{1}{2} D$$
$$H \text{ (maximum)} = 2D; \text{ or, } H = D \times (1\tfrac{1}{2} \text{ to } 2)$$

The minimum of $1\frac{1}{2}$ D is based on the fact that the optimum height: diameter ratio for the longest cooling time per unit volume is 1:1 and the extra 50 per cent. is added to allow for liquid shrinkage before the metal begins to set in the mould.



FIGS. 10 TO 13.—*Plan sketches showing the absence and stages in the adoption of the Nielsen technique.*

Effect of Metal Composition

In a calculation of the necessary weight of metal in the riser, some consideration must be given to the composition of the metal. Grey-iron solidification-shrinkage varies from 0 to 5 per cent. and the proportion of metal in a riser which will feed into the casting can be taken as 25 per cent. Hence the minimum weight of a riser for a low-carbon iron having a solidification shrinkage of 5 per cent. will be: $\frac{5 \times 100}{25}$ per cent., or 20 per cent. of the casting weight. Figures as high as 40 per cent. have been given for feeding efficiency of risers, but it is considered that 25 per cent. is a safe figure for uninsulated risers.

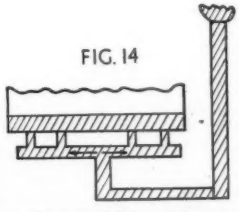


FIG. 14. — *Horngate technique adapted to the Nielsen running method.*

Runners and Risers

The next step is to compare the two figures for riser volume or weight obtained from the consideration of casting thickness and from weight of feed metal required. In the majority of cases it will be found that the riser calculated from the formula D = 2T + 1 in.; H = D × 1½ in. has a sufficient weight to feed the casting. This is then used as the minimum satisfactory riser. If the casting weight is so great in relation to its thickness that more metal is required (as in the case of a long thick plate), there are two alternatives. Either the number of risers or the size of one riser, or in certain cases both number and size, must be increased. It is considered, however, that a small number of large risers and a strong directional solidification effect is better than a large number of small risers. It is most important that the riser diameter be not less than 2T + 1 in.

FIG. 15

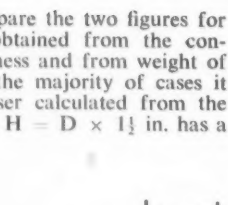


FIG. 16

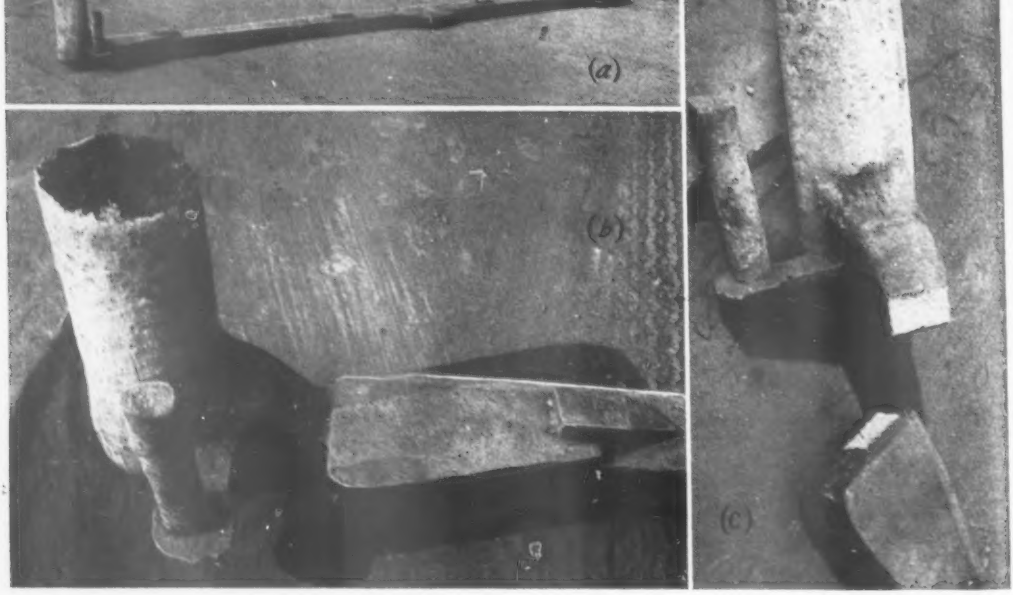
FIGS. 15 AND 16.—*Design of riser neck and type of fracture when breaking off.*

It will be noticed that the emphasis throughout this argument is on the ratio of riser-diameter: casting-thickness, rather than on riser weight, and the submission of the Author is that reliance on the weight of metal in the riser instead of the ratio of dimensions is the cause of many foundry shrinkage troubles.

Breaking Off

It may be said that the risers calculated by the above method are too thick to break off without risk of breaking into the casting. Leaving aside the use of knock-off cores, which are simple to use and coming every day more and more into general foundry use, the solution lies in the correct design of the riser neck. This has its thinnest point equal to 80 per cent. of the wall thickness of the casting, the reduction of the size being made at a 45 deg. angle and the increase to riser diameter being kept also at 45 deg. The appearance of the neck and the type of fracture normally obtained from a sharp blow are shown in Figs. 15 and 16. It is

FIG. 17.—(*a*) *Casting of great length in relation to width and* (*b*) *and* (*c*) *enlarged views of the running and risering arrangements for it.*



seen that the pad on the casting is sufficient to eliminate the usual "breaking-in" trouble.

When this method has been applied to machine-moulded work, particularly in quantity production from the usual small-size boxes, it has been found convenient to use tangentially gated shrink-bobs, which act as side risers. An improved yield may be obtained by cutting down the diameter of the shrink-bobs to 2T + ½ in., or preferably by grouping two or more castings round a central shrink-bob. When more than one shrink-bob per casting is needed to feed isolated chunky parts, it is essential that the gating is through all shrink-bobs. In suitable cases a runner bar ½ to 1 in. thicker than the casting section and somewhat higher than it is thick will provide a satisfactory feed on machine-moulded work.

In closing, it is of interest to illustrate—in Fig. 17—the successful running and risering method adopted for a casting of great length in relation to its width.

DISCUSSION

When Mr. Millington's Paper was presented at a meeting of the East Midlands branch the following discussion took place:—

MR. HAYDEN said Mr. Millington had mentioned a figure of 80 per cent. Was this 80 per cent. of the diameter of the feeder, and, if so, the sketch did not appear to be in proportion.

In reply, MR. MILLINGTON said the figure was 80 per cent. of the thickness of casting.

MR. HAYDEN then said the break-off portion seemed to be rather excessive—about 45 deg. Was there any reason for that?

MR. MILLINGTON replied that the 45 deg. angles on the break-off pad and riser gave a very clean break.

MR. J. HILL asked if the basic principle would apply to any type of metal and whether when using a runner as a feeder on the flange of a casting with some thickness of metal beyond the flange, which dimension would be taken for computing the 80 per cent.

MR. MILLINGTON said the system would apply to any type of metal and that the riser diameter would be worked out on the thickest section one had to feed, but the break off would be 80 per cent. of the flange thickness.

MR. POLLARD, with regard to Mr. Millington's statement that a spherical riser was better than a cylindrical riser, but was not a practical proposition, asked if this was because it was difficult to get an accurate spherical shape in jobbing work. Had Mr. Millington any practical experience of the use of spherical risers?

Mr. Millington replied that he had no experience of the use of truly spherical risers, but had merely read other people's views on them. They were not practicable owing to the cost of coring. He had used shrink-bobs which were approximately spherical in shape.

Problem of Long Cylinders

MR. C. PAYNE said Mr. Millington had dealt primarily with flat or rectangular sections. How would he deal with the problem of a cylinder, where the length was great compared with the diameter. There were some cases where the riser had to be put away from the feeder, and in consequence received cold metal. How would Mr. Millington overcome that.

In reply, MR. MILLINGTON said that he would normally prefer to cast a cylinder vertically, and merely make a head 1 in. dia. greater than the bar itself, or make the bar extra long. As to risers being put away from the feeders, in those cases he would prefer to top up with hot metal as soon as the casting had been poured or, alternatively, exothermic risers could be very useful. He preferred to cover all risers with exothermic material immediately the job had been poured, with dry sand on top of the whole.

MR. PAYNE said that exothermic material should enable one to reduce the risers.

MR. MILLINGTON agreed, but the question of economics had to come into consideration. Generally it was cheaper to make a riser chunky rather than use an exothermic sleeve.

MR. GOSS asked for an explanation of the formula for calculating the riser diameter. It appeared to him that there could be examples where one added 1 in. to a certain design of casting and yet 1 ft. was required for another.

MR. MILLINGTON said that was a very important point; if the cylinder was double the plate thickness it cooled at the same speed irrespective of the size of the plate. By adding 1 in. it cooled slower than the plate whatever the plate thickness. The idea was to get a system which any moulder could apply, particularly in jobbing work, with the simplest possible mathematical basis but with, if possible, 100 per cent. success.

A ROLLING MILL, which has been built at a cost of £500,000, has begun production at Badami Bagh, Pakistan.

TWENTY-FOUR representatives of foreign countries visited the Birmingham Exchange and Engineering Centre recently.

AN APPLICATION has been made by the Association of Scientific Workers to the Engineering Employers' Federation for a substantial increase in salaries of scientific and technical staff employed in the engineering industry.

SIXTEEN EMPLOYEES of the Northern Aluminium Company, Limited, at Handsworth, Birmingham, have received watches for 25 years' service with the company. The watches, however, were made of aluminium and specially made in Geneva.

LAURENCE, SCOTT & ELECTROMOTORS, LIMITED, has received a contract from the United Kingdom Atomic Energy Authority for electrical equipment valued at more than £400,000. Delivery will begin in the middle of 1955 and will continue for some time after.

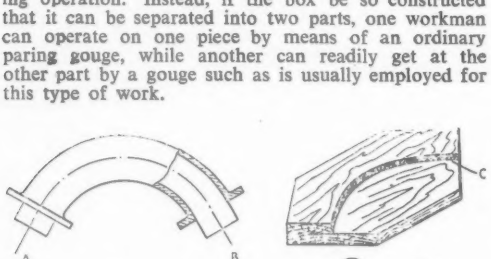
THE British Electrical Development Association has appointed an Industrial Development Committee "to consider the steps to be taken to foster and develop the use of electricity in industry." Mr. L. Howles, chairman of the South Wales Electricity Board, is chairman and Mr. J. F. Smith, chief commercial officer of the South Wales Electricity Board, vice-chairman.

Time Saving in the Patternshop

By "Chip"

In patternshops attached to the small jobbing foundries in this country, possessing only a lathe, band and circular sawing machines, work must be so planned that their machines can be used to the best advantage. Thus may be reduced the hand work necessary for the completion of a job, and time can be saved, factors of considerable importance in a jobbing shop.

Although in such shops resort is often made to the use of core frames and strickles to produce pipe cores. occasions arise when a complete corebox is called for—when a large number has to be made—as in the case of a bend pipe shown in Fig. 1. Many patternmakers would build this corebox in such a way that a considerable amount of hand work would be necessary, with outside ground gouges, a most time consuming operation. Instead, if the box be so constructed that it can be separated into two parts, one workman can operate on one piece by means of an ordinary paring gouge, while another can readily get at the other part by a gouge such as is usually employed for this type of work.



FIGS. 1 TO 4.—*Practical devices for employment in the patternshop in order to eliminate time-consuming operations.*

A base board is first prepared and on this is scribed a line corresponding to the centre-line AB, Fig. 1, a piece of timber about 2 in. thick is now prepared on the band-saw to suit this line as at *C*, Fig. 2, the other portion being fitted to this and both secured to the bottom board by screws. Segments are then built up on each half, as with ordinary practice, until the box is complete, then the shapes are marked on each end and on the top.

The bottom screws are next withdrawn and each part has a piece screwed to it to hold it in a vice and the parts are worked separately, as in Fig. 3. By this method, time is saved, not only in permitting two men to operate on the box at the same time, but also in the easier work which results from being able to get at the part to be cast much more easily,

The glass papering of such work is often a tedious operation, as the box curves in two directions and it is not possible to use a piece of shaped cork as for straight lengths. Some form of flexible holder for

(*Continued at foot of col. 2*)

the glass-paper is an advantage and saves "wear" on the workman's fingers. Such a holder is shown in Fig. 4. Where *A*, is a piece of flexible rubber attached to handle *B*, by a screw. The glass-paper after being cut to such a size as to fit around the rubber and the ends tucked in under the handle, a twist of the handle tightens it and it is ready for using. Being flexible, the rubber readily takes the form of the box and the workman can very speedily finish off a box by the help of this simple aid.

Newman Hender acquire Shipham & Company

The entire share capital of Shipham & Company, Limited, manufacturers of valves, fittings and castings, has been bought by Newman, Hender & Company, Limited, makers of valves and pumps, etc., Stroud. This consists of 50,000 shares of £1 each. Shipham control George Clark & Sons (Hull), Limited, the coppersmiths. The consideration for the Shipham shares will be satisfied by the issue to shareholders in that company of 150,000 5½ per cent. cumulative preference shares of £1 each and 150,000 ordinary 10s. shares in Newman, Hender & Company plus a payment of £653,000 in cash.

Shipham's present directors are Mr. F. G. Burrell and Mr. T. R. Ferens, whose families hold upwards of 95 per cent. of that company's issued shares. They will continue in office. Net assets of the Shipham group totalled £632,000 at December 31 last. £220,000 excess over book value of a valuation of fixed assets appearing in the books at £50,000 only must be added. In 1947 profits before tax were £95,000. In 1953 they were £162,000.

Technical Courses in London

Sir John Cass College, Jewry Street, Aldgate, London, E.C.3, announce that evening courses are to be held in the new year covering the following subjects:—"Recent Developments in Molecular Theory"; "Absorption Spectroscopy"; "Practical Spectroscopy"; "Patents and Industrial Design Protection"; "Microchemical Analysis"; and "X-ray and Optical Crystallography." Details of these courses are available on application to the principal at the address quoted above.

Northampton Polytechnic, St. John Street, London, E.C.1, are organizing courses of varying duration early in the new year covering systematic study of "Refractory Technology"; "Heat Transfer"; "Materials of Construction"; "Recent Developments in Metal Finishing" and "Liquid Fuels." Details are available on application to the principal of the Polytechnic.

SPEAKING at a centenary dinner for the supervisory staff of Joseph Sankey & Sons, Limited, Hadley Castle (Wellington) works on December 18, the general manager, Mr. G. B. Sankey, said he believed that the next 10 years would see a very rapid rise in the standard of living for the people of this country providing there was a reasonable degree of world peace and the maximum use of modern inventions. The managing director, Mr. H. F. Hodgson, who moved recently to the Bilston establishment of the company, was presented with a watch from the supervisory staff of the firm.

Fifty-years' Reminiscences

Presidential Address by C. N. Jennings

At his inauguration as president of the East Anglian section of the London branch of the Institute of British Foundrymen, Mr. C. N. Jennings addressed members in the following terms:

In an introduction by Mr. V. C. Faulkner to a book called "Modern Foundry Practice" it is stated that for more than 5,000 years, craftsmen have been making castings for either artistic or utilitarian purposes. Specimens covering this period are housed in museums throughout the world, not with the object of portraying the development of the foundry industry, but rather to illustrate such interests as the art of ancient China; the earliest types of machinery, medieval kitchen ware, Roman civilization, and so forth.

Castings are made in innumerable alloys, but for commercial purposes they can be considered as falling into the following groups: Iron (including grey, white and malleable), steel and heavy non-ferrous (including brass, bronze and lead, etc.). For melting such a range of alloys, every conceivable type of furnace, ranging from a tiny crucible to an open-hearth tilter, having a capacity of more than 100 tons, is used. The smallest commercial castings regularly made will weigh fifty to the ounce, whilst some of the heaviest in Great Britain are ingot moulds, ranging between 100 and 200 tons. These large castings require three to four weeks to cool down after being poured. The majority of castings are made in moulds compounded of dry or green-sand, consolidated either by mechanical or hand ramming around a removable pattern, or by the skilled craft of loam moulding. But few castings are solid blocks, and if they are not mouldable otherwise, the hollow portions are formed by the insertion of cores, carrying the desired shapes. For instance, a cylindrical core forms the centre of a pipe casting. Not all pipes are made in sand, and thousands of tons of pipe-castings for water, gas, etc., are made each year by the centrifugal process. The iron die-casting business utilizes metal moulds on turntables, which, after filling with metal, open automatically at one position, eject the casting at another, are sprayed at a third, closed at a fourth, and receive more metal at the completion of a cycle of the turntable.

Sub-division of Effort

It will be realized from what has been indicated that the foundry industry is both vast and complicated, but that is a matter of no consequence to the individual, as no single concern, or individual, touches upon more than a mere fraction of the total effort. Indeed, it is quite normal to find complete ignorance on sections of the industry not covered by direct commercial interests. A steel foundry may have the sketchiest knowledge of light alloys and *vice versa*.

A foundry is usually divided into a number of departments, and the initiating one (apart from the drawing office) is the patternshop where I, as an apprentice, gained my first knowledge of the foundry industry. This was in the year 1904, and there has been a great deal of progress since then. Some say comparisons are odious, but it is as well at times to consider how the industry (which has so often been called the Cinderella) has advanced away from that concept over the last 50 years.

The average working week, when I started, was of 54 hours' duration, and most foundries started at 6 a.m. with half an hour for breakfast, 1 hour midday break and finished at 5.30 or 6 p.m. Some, however, worked only 50 hours per week, commencing at 8 a.m., as a number of employers did not believe it was a good thing to start work on an empty stomach. Of course, overtime meant working when required, sometimes till 10 p.m. for five nights a week and for several weeks on end. Also, when trade was slack, working for but 3 or 4 days per week was not uncommon.

Machinery and Tools

The introduction of improved machinery has done much to take some of the "donkey work" out of the industry. It was quite common when I was a boy to plane up "deals" of 11 by 3 in. from 10 to 12 feet long by "Jack and Trying Planes," using winding strips to see they were true. Also, pine and mahogany boards and battens were cut from baulks with a pit saw, one man on top and the other in the pit. An outstanding feature in the patternshop is the number of portable power tools which have been invented and improved. These can be taken to the job, with much more ease than handling a large, awkward pattern or board over a planer, saw or drill. Among such portable labour-saving tools I would name the planer, with 4 in. cutter; circular saws, with 8 in. dia. saw; router for all kinds of recessing for rapping plates, lifting straps, etc.; electric drills, and electric screwdrivers, also sanders, both rectangular and circular. The electric band-saw welder, with which a mechanic can repair a $\frac{3}{4}$ in. band-saw in 5 mins. which used to take anything from $\frac{1}{2}$ to $1\frac{1}{2}$ hours to braze and then frequently broke near the repair because of the loss of temper. But a few of the tools have been named which have been introduced to take some of the hard "slogging" out of heavy patternmaking, without necessarily reducing the skill of the craft.

Foremen

A personality sometimes discussed to-day is the foreman, is he as skilled as was his counterpart, say 50 years ago? Then, of course, he was the "king pin" of the department, and wore a bowler hat as his badge of office. In modern times, however, he has been forced, by bigger demands for much great production of all kinds of castings at an economic price, to introduce various systems, such as pre-planning, budgetary control, rate-fixing,

Fifty-years' Reminiscences

standard costing, time- and motion-study, and various kinds of bonus systems, and collective and incentive schemes. Most firms to-day have one or several of these systems, which call for a number of experts with their staffs, with all of whom the modern supervisor has to co-operate, from time to time.

The personnel manager and safety officer also play their part in most organizations, relieving the foreman or supervisor of duties which he had attended to in the past, and this arrangement should give him more time for exercising his experience and technical skills.

Technical Control

The laboratory also plays a most important function these days, in most cases being responsible for sand mixes, cupola control, analyses, test-bars, etc., in fact all the necessities for quality control, and for meeting engineers' and inspectors' specifications.

In my early days, at least some of this work was the responsibility of the foreman, who claimed that by taking a handful of sand and rubbing it on a handle of a shovel, he could judge if it were fit for the job on hand; also, the grades of pig-iron were ordered from the smelters' specifications, and the usual test carried out in the shop was breaking a few pigs and examining the fractures.

I remember the foreman of the moulding shop invariably coming to work with an umbrella, which stood in his office, and was used by him to measure up the length, breadth, and depth of large patterns, and to "prod" the various box-parts, plates and other tackle required. He also gave estimates for castings when required, and as he fixed the various piece rates and times, he was seldom wrong.

The patterns and coreboxes were marked with chalk, as to how many castings were required, with the appropriate number. This information and details were taken from what was called the "Chromo" book, which was filled up from day to day by one of the drawing-office staff, and written-up by hand.

Craft Retention

The shops I am chiefly thinking of were, and are, jobbing types, and although the introduction of moulding machines, bumpers, impeller rammers, etc., has enabled the industry to break down various jobs, to use semi- and less-skilled labour, in my opinion, for quite a number of the larger intricate castings, there is no substitute for the skilled moulder. Despite the achievements of the mechanical foundries, both as to numbers off, and all the economies coupled with them, there must be the team of highly-skilled craftsmen, not only to scheme and make the tackle, but to keep it in first-class order. The casting can only be as good as the pattern.

It is with these craftsmen and technicians I am concerned. Those in the foundry industry in these changing times, must continue to pick out our smarter lads to train and encourage them to fit themselves for the higher positions, as they become available. I was told, when I started, that the foundry industry was a dying trade, and that with the advent of welding, castings would be gradually ousted from engineering, and that welding would be much cheaper, as it did not require pattern-makers, who were looked upon as "necessary evils." I have since heard that plastics would also be a serious menace to the foundry industry, but I am optimistic of the future, as there is room for all of us. It is up to all in the Institute to spread knowledge to the younger element. I believe there is more scope in this industry than ever before, and there is a bright future for the young man who is prepared to work and study and improve on the "spade work" which has been done by the older man.

In conclusion, Mr. Jennings thanked the Council and members for the honour of electing him president, and hoped he would be able to carry out his duties in the manner of the late president, Mr. Ward, and all previous presidents.

New Catalogues

Protective Clothing. A series of six double- or three-leaf folders received from James North & Sons, Limited, Godley Mills, Hyde, Cheshire, covers such items as gloves, chemical-resistant clothing, aprons, and the like, all of which carry the appellation P.V.C. The pamphlets are quite attractive and are available to readers on writing to the Hyde address.

Bench Assembly and Storage Trays. Now that better work-study methods are permeating the foundry industry, a four-page leaflet received from Precision Components (Barnet), Limited, 13, Byng Road, Barnet, Herts, is of increasing interest, as it deals with the production of trays. These items are placed in either a straight or curved line in front of an assembly operator. To prevent movement, the trays can be interlocked. The leaflet is available to readers on writing to Barnet.

Resistance Wire. A leaflet, received from Henry Wiggin, includes data on Brightray B, and illustrates typical application. It is made by a patented process, and has resulted in the production of an insulating coating on a nickel-chromium-iron alloy with a high specific electrical resistance, but the oxide normally formed has low insulation properties, and this material cannot, therefore, be used for close-wound resistances. To produce oxy-insulated Brightray B the wire is first plated with nickel, which is subsequently oxidized. Copies can be obtained from the publications department, Henry Wiggin & Company, Limited, Thames House, Millbank, London, S.W.1.

Clad Steels. A very interesting brochure has been received from Colvilles Limited, 195, West George Street, Glasgow, which details the performance and properties of the "Colclad" range of stainless-, nickel- and Monel-clad steels. They are manufactured by rolling a "sandwich"—consisting of billets of mild steel, the corrosion resisting alloy, a parting material, the corrosion-resisting alloy and mild steel. The method provides a germ of an idea for composite castings which has interesting applications to foundry practice. In fact, years ago, an American firm used to cast large gear-wheels with centres of mild steel and around this a thick layer of special alloy steel. The brochure is beautifully produced, well illustrated, and contains much valuable technical data.

Iron and Steel Research

Current Projects of Interest to Foundrymen at the London Group of B.I.S.R.A., Laboratories.

(*Continued from page* 757)

Instrumentation

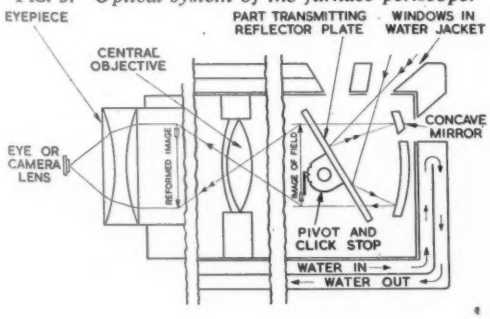
The study of instrumentation in the laboratories of the British Iron & Steel Research Association is in four sections:—(1) Design of industrial instruments; (2) design of research instruments; (3) advice on instrumentation problems and liaison between the steel industry, the instrument industry, and a number of allied industries; and (4) fundamental work on techniques of measurement. Examples of each kind of activity illustrated the wide field that the iron and steel industry presents. Examples of specific projects carried out in the last few years are described in what follows. Some of these projects started as research instruments and have subsequently been modified for industrial use.

Photo-electric Dust Monitor:

The measurement of residual solid contaminants in industrial fuel gases can be carried out by several established and accurate techniques, but the small quantity (of the order of 20 mg. of solid per metre cube of gas) means that only an average reading over many hours can be obtained. The B.I.S.R.A. instrument gives information complementary to that obtained from gravimetric sampling. It is continuous in operation and gives a reading which is related to dust concentration at any one time although a precise calibration may not be possible.

The instrument uses a light-scattering technique in which a parallel light beam is passed axially through a sampling chamber, through which is drawn a gas sample at the rate of a few cubic feet per minute. Dust, if present, scatters some of the light in a direction normal to the axis of the beam. This scattered light, which is related to the dust concentration, is measured by two or more photo-multiplier valves which drive a recorder through an intermediate amplifier. Thus any sudden change in dust concentration (due to variations in performance of gas-cleaning plant) will show up on the chart within a few seconds.

FIG. 3.—*Optical system of the furnace periscope.*



Thickness Meter:

This instrument is intended to measure the thickness of steel plate up to ¼ in. thick when only one face is available for test. Examples of its use include measurements on oil tanks, gas holders, etc., where erosion or corrosion may occur at an unknown rate. It is battery operated and is completely portable for field use.

The instrument consists of a powerful electro-magnet which is placed on the test sample. The maximum flux which can flow round the magnetic circuit so formed will be limited by the properties of the test piece and its effective cross section in the test zone, which is proportional to its thickness.

Furnace Periscope:

To facilitate observation of the interior of an open-hearth furnace, a water-cooled periscope has been developed which can be inserted in a 6-in. hole anywhere in the furnace and can scan the whole interior. Visual or photographic observation of flame distribution, temperature distribution and roof erosion can easily be made. A schematic diagram of the instrument and its fields of view is given in Fig. 3, the zones of view—for an open-hearth furnace—being shown in Fig. 4.

A partially reflecting plate at the focus of a concave mirror can select one of three small apertures in the periscope shell, each aperture giving a field of view of about 40 by 36 deg. These three zones range from the axis of the periscope to 120 deg. to the axis, and by rotation of the periscope about its axis, the whole of the furnace can be inspected, except for a small zone around the viewing hole. The concave mirror together with a central objective and eyepiece gives an image at the remote end of a water-cooled tube 5 ft. long.

Stereo-photography:

The value of stereo-photography as an aid to the understanding of some iron- and steel-making processes was realized some years ago. This technique has been applied to the study of the movement of the burden of a blast-furnace in the combustion zone, which is partially visible when looking through the tuyères. Stereoscopic (3D) films were taken of this region at up to 3,000 frames per sec. through two special quartz windows in the tuyères. An optical-mechanical method was devised for analysing the resulting films which could quickly supply accurate data of the size, position, and velocity of the particles visible. It is of interest to note that the films showed that the hot blast opens a cavity 2 or 3 ft. deep in front of each tuyère in which particles move with a high velocity and often with a circulatory motion.

Iron and Steel Research

Eddy-current Techniques:

It has long been known that if a coil carrying a high-frequency current is brought close to a conductor, eddy currents are induced in the conductor. The apparent effect of these eddy currents on the energizing coil is to alter its electrical constants, *i.e.*, its resistance and inductance. A detailed study has been made of the relations between the physical properties of the conductor, the geometry of the system, and the effects produced, and this work has led to applications of the technique to specific problems. For example, an instrument has been produced which can measure the thickness of highly conductive coatings such as tin on a less conductive base such as steel. The range of measurement is about 0.000015 to 0.0006 in. of tin with an accuracy of about 15 per cent. Other possible applications include the detection of surface flaws such as cracks, etc., which have the effect of producing a surface layer on the material of somewhat higher resistance than the remainder.

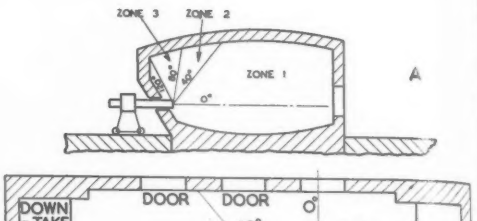


FIG. 4.—*Zones of view of the periscope in an open-hearth furnace; A—vertical scanning; B—horizontal scanning.*

General Physics

New techniques for studying phase changes in steels by X-ray methods have been developed by the General Physics Section. The change from austenite to ferrite below the A_3 point occurs fairly quickly with many steels, and the classical methods for examining these phase changes have been based on changes in length or in the magnetic properties during transformation. Such methods are therefore indirect. When the phase changes occur quickly it is not possible to photograph the X-ray diffraction powder patterns, as the time of exposure required to produce a satisfactory film is far too long. Consequently a direct X-ray method was developed in which a Geiger-Müller counter was used as detector, the signal received being amplified and recorded. This counter can be set to receive the reflection from a suitable set of crystallographic planes of atoms either of face or body-centred cubic iron (austenite or ferrite). During an isothermal transformation the X-ray energy received by the counter then measures directly the fraction of the particular phase selected for study. The technique has been used to obtain S-curves of known steels, which by this method can be completed in a very much shorter time than is required by the conventional methods used hitherto. The S-curves so obtained were found to agree very well with those obtained from dilatation or magnetic changes in the steels during transformation.

Rates of Stressing

By arrangement with the Ministry of Supply, a B.I.S.R.A. research team was formed in January, 1954, to examine the behaviour of materials such as mild, hardened carbon and alloy steels at high rates of loading. This work is being carried out with the advice of Professor E. N. da C. Andrade, F.R.S. The ultimate object of the investigation is to throw light on the behaviour of materials under very high rates of strain, such as are produced in practice by the impact of projectiles and under such tensions as occur when the charge explodes. It is hoped that the information derived from these experiments may ultimately be of value for improving the design of projectiles and armour for Service application. In particular, it is thought that a closer acquaintance with the mechanism of permanent deformation, cracking and rupture lead to the possibility of carrying out preliminary tests on materials without the necessity of elaborate firing trials.

Continuous Casting of Steel

The extra work involved by the rapid development of the continuous casting of steel has necessitated the formation of a special section in the Physics Department to deal with steel casting. Fundamental investigations of the principles of billet casting have been studied over a number of years and these have led to the construction recently of the first B.I.S.R.A. industrial pilot plant for the continuous casting of steel.

It was two years ago that the steel industry was approached with a view to erecting a full-scale pilot plant to study the economic and metallurgical problems of the process. A continuous-casting development group was formed consisting of 11 steel companies who together financed the construction of a plant in Sheffield at the works of Wm. Jessop & Sons, Limited, for the production of alloy and special steel. This plant, designed by Campbell, Gifford and Morton, Limited, in consultation with B.I.S.R.A. has now been undergoing trials for about six months.

The billet is withdrawn from the mould by rollers and cut into convenient lengths by an automatic flame cutter. In order to increase productivity there are two casting strands running side by side. These are both fed from one ladle by means of a tundish which divides the stream into two. The two streams entering the moulds are equalized by the operator tilting the tundish.

Plans are now well advanced for extending the research on continuous billet casting by the erection of a new plant in the B.I.S.R.A. Sheffield laboratories. An important development will be to devise a means of controlling the method automatically.

New Recording Device

A new means of automatically recording data on paper tape has now been developed. As the records can be analysed by a computor with great rapidity, much time can now be saved and more comprehensive tests initiated. The principles of the method are similar to those employed for punched card systems, but teleprinter tape is used as the recording medium. This has the advantages that the record is continuous and that the machines perforating the tape are suitable for use in steelworks. Analysis of the recorded data by an electronic computer also offers the advantage that almost any statistics which the records are capable of providing can be obtained. The method may also prove acceptable to steelworks, power stations and elsewhere.

Punched tape has already been used operationally to record lengths of travel of cranes over extended periods and the performance by screwdown motors on primary mills. In another trial several of the operations of a rolling mill have been recorded for analysis, while in the laboratory the method provides a ready means of recording and analysing control movements in the development of the foot and hand controllers.

At present five independent items can be recorded simultaneously by one perforator head, but as many as 31 events can be recorded on one tape as long as any two do not occur simultaneously. A scheme exists for increasing the number of items which can be recorded by using perforator heads in parallel.

Mechanical Engineering

Linked with a study of friction in rolling mills is a programme of observation of mill operation. Tests at two mills, using different recording techniques, *viz.*, direct pen recording and teleprinter recording, have been carried out.

The object of these tests initially was to examine the auxiliary motions such as operating the mill screws, feeding the ingot into and out of the mill at each side, tilting and manipulating the ingot, and to discover which of these were most likely to hold up operation and therefore overall output. In parallel with these observations a study of overall working from soaking pits to shears is being carried out by a member firm.

Although it is well known that manipulation, particularly tilting, is the main cause of delay between passes, the records have now given an exact measure of this delay in these particular mills. An extended survey over mills of different types will, it is hoped, show which designs of tilting gear are giving the best results in relation to ingot size. Observations of the tilting gear movements have also been made by slow-motion ciné camera. Such techniques of observation and delay computation have obvious parallels in foundry practice.

Corrosion Research

One of the major subjects studied in the Chemistry Department is that of corrosion. Earlier studies of corrosion in air was followed by a more detailed study of the effect of composition on corrosion resistance, in which small percentages of numerous elements were added to laboratory heats of mild steel. Specimens of strip and wire made from these steels were exposed outdoors at Sheffield for periods of up to five years. Small amounts of certain alloying elements, notably chromium, copper and nickel, were found to reduce the corrosion of the steel considerably. For example, a steel containing 1 per cent. Cr, 0.5 per cent. Cu, 0.16 per cent. P, and 0.8 per cent. Si, proved nearly three times more resistant than unalloyed steel.

The superiority of these low-alloy steels is connected with the properties of the rust formed on them, which contains more sulphate than that on unalloyed steel. The alloying elements seem to give rise to insoluble basic sulphates, which accumulate in the rust and render it less permeable. This hypothesis is being studied in a new research on the properties of rust.

The experiments have shown that low-alloy additions have much less effect in reducing the corrosion of steel by sea-water than by the open air. There was no significant difference in corrosion resistance, for example, between copper-bearing and ordinary steels when immersed in the sea.

Inhibitors are a valuable means of reducing corrosion in fresh water. A quantitative laboratory study of their efficiency, as affected by the temperature and composition of the raw water, has recently been started.

Considerable progress has already been made in developing satisfactory coatings for the protection of steel against corrosion by air and by water. Experiments have demonstrated the vital importance of correct surface preparation of the steel to receive the protective coating. For example, steelwork to be exposed to the atmosphere should be completely descaled and derusted by pickling or by grit-blasting immediately before it receives the priming coat of paint.

Extensive researches on the formulation of priming paints for atmospheric work are being made in collaboration with the British paint industry. For protection against sea-water, several satisfactory anti-corrosive compositions have been developed; one of these has been adopted by the Admiralty for use on the hulls of H.M. Ships.

The protection of steel by metal coatings is also being investigated. Aluminium and zinc are particularly valuable for this purpose. For example, in exposure tests at Sheffield a sprayed aluminium coating, weighing $\frac{3}{4}$ oz. per sq. ft. or about 0.003 in. thick, protected steel for 10 years.

Physical Chemistry in Steelmaking

One of the greatest obstacles to the application of physico-chemical principles to the elucidation of slag-metal and slag-gas reactions is lack of knowledge of the activities of the reacting species; the use of weight or molal concentrations in expressions of the mass action law frequently leads to

Iron and Steel Research

highly variable "constants" and makes it difficult to predict metal composition from slag analysis. This drawback has been remedied by computing, from available data, the activities of ferrous oxide, manganous oxide and phosphorus pentoxide in slags as a function of slag composition and it is now possible to calculate the equilibrium contents of oxygen, manganese, phosphorus and sulphur in steel under any slag and it is being discovered how closely, during iron and steel making, the distributions of manganese, phosphorus and sulphur between metal and slag approach equilibrium. It has been shown already that oxygen in the metal is not in equilibrium with the ferrous oxide in the slag nor with the dissolved carbon; this is attributed to the relative sluggishness of the carbon/oxygen reaction.

It was thought that the sluggishness of the carbon/oxygen reaction in iron is the cause of the apparently high sulphur content of blast-furnace iron. If this were indeed the case, any reaction which reduced the excess oxygen in carbon-saturated iron should lead to a further sulphur transfer from metal to slag.

Experiments on Sulphur Transfer

To prove the validity of this hypothesis, experiments were conducted to investigate the effects of silicon, manganese and aluminium on sulphur transfer. In order to determine the rate of sulphur transfer from metal to slag, the two liquid phases were allowed to remain in contact with one another at 1,500 deg. C. for a specified period of time, after which any reaction was stopped by rapid quenching of the system in water; the sulphur content of the metal was then determined. It was ascertained that deoxidants, that are known to react rapidly with oxygen, do in fact increase the rate of desulphurization. Other conclusions reached from these experiments were (i) the transfer of sulphur from metal to slag across the interface is accompanied by a transfer of iron, manganese or similar cations from the metal; (ii) if the desulphurizing reaction takes place in a graphite container, then there is carbon suspended in the slag and this reduces the iron oxide in the slag, resulting in the formation of metallic iron which can be in a very fine state of sub-division; and (iii) if no reduction takes place in the slag, then an atom of oxygen is transferred from slag to iron for each atom of sulphur passing into the slag layer.

MR. G. B. SANKEY, managing director of Joseph Sankey & Sons, Limited, presented on December 11 a cheque for £10,000 to the village of Hadley, Shropshire, to commemorate the firm's centenary. The ceremony also marked the opening of new playing fields of the firm by Mrs. H. F. Hodgson of Hadley Park.

THE INAUGURAL MEETING of the Yorkshire section of the Institute of Materials Handling was held in the Mappin Hall, Sheffield University, on Friday evening, December 10, when an address was given by Mr. R. G. Winton, member of the Organization for European Economic Co-operation mission to the U.S.A.

Publications Received

"First Impressions" and "Supervise with Care," being Instructional Booklets Nos. 1 and 2 for use with B.A.C.I.E. Visual Units issued by the British Association for Commercial and Industrial Education, Management House, 8 Hill Street, London, W.1.

The first of these booklets covers a film-strip designed to show the right and wrong attitude towards newcomers to a factory. To be of use, it should appeal to the employer rather than the applicant, and in this it fails, as the former class is quite capable of understanding and appreciating the written word.

The second is equally puerile for it cannot and must not be assumed that supervisors are congenital idiots. Obviously, here and there, the type of supervisor portrayed does exist, but being in the minority, the question which ought to be posed is "Can such a film-strip be worth while?"

The Coneygre Story, by W. K. V. Gale, F.R.Hist.S. Published by the Coneygre Foundry Limited, Tipton, Staffs.

This interesting account of the history of the Coneygre Foundry is worthy of better presentation. The pale-blue stiff paper backs are more suited for enclosing a price list of hardware, than a valuable contribution to metallurgical history, covering a period of 663 years. Like most of the venerable concerns in the foundry and related industries, the early beginnings started in iron mining and smelting. The little stream now running beneath the works suggests that it would be used for water power. By 1625, it is established that a blast-furnace was in operation.

The works, until comparatively recent times, belonged to Lord Dudley and the claim of his natural son, Dud Dudley, to have invented the use of coal for smelting iron is diplomatically dealt with, and the reader is left to draw his own conclusions. By 1717, the Coneygre works became a forge but in 1793 it is established that blast furnace was erected. By 1834, the word "castings" appears for the first time, but essentially the works was a typical three blast-furnace concern until 1878. In 1896 the plant was put up for auction, dismantled and the site was used as a slag-crushing plant. In 1904, however, it became a jobbing foundry mainly devoted to colliery castings, but in 1914 a new shop was built to make aluminium aero-engine cylinders, whilst a second was converted to make cast-iron automobile cylinder-blocks. In 1925, the living connection with the Dudley family was severed. From that time onwards, progress has been continuous and impressive, and its achievements have been duly recorded in the JOURNAL. This well-written story ranks high amongst works devoted to the history of technology.

A.B.B.F. Advisory Service

A meeting will be held at the Engineers' Club, 17, Albert Square, Manchester, on Monday, January 10, 1955, commencing at 7.15 p.m., to discuss sands for non-ferrous foundries, and will open with a talk by Mr. A. Tipper, of the Harborough Construction Company, Limited. There will be ample opportunity for discussion and questions. The meeting is one of a series arranged under the advisory-service scheme by the Association of Bronze and Brass Founders, and an invitation is extended to all interested firms to send delegates.

Notes from the Branches

Newcastle-upon-Tyne

About 60 members and visitors were present at a meeting of the Newcastle-upon-Tyne branch of the Institute of British Foundrymen held on December 11 in the Neville Hall, to hear Mr. R. W. Mann, chairman of the Tyneside Committee, British Productivity Council, introduce two films dealing with some aspects of productivity. Mr. C. W. Stewart, president of the branch, who was in the Chair, introduced Mr. Mann and emphasized the importance of the subject, which, he expected, would cause considerable discussion.

Lesson from the Budget

Mr. Mann, in a preliminary to the presentation of the films, chose an unusual approach to the subject of productivity by discussing some aspects of the national budget. He said the only money available to meet the country's heavy expenditure was obtained by taxation. After enumerating the main items of expenditure, he said he thought it could be assumed that very few people would agree to a reduction of any of the items to an extent which would have any appreciable effect on taxation. He, therefore, concluded that the only way to improve living conditions was to increase the production of saleable goods and sell them in the world's markets. However, the available labour in this country was almost wholly engaged, hence the need for increased productivity from each individual. An increase of 10 per cent. in productivity, which Mr. Mann regarded as easily possible, would make a tremendous difference to the country's finances and would reduce the need for the purchase tax, for instance, or lead to a reduction in other forms of taxation, leaving more money available for individual disposal for the improvement of living conditions. There were few who could not improve their productivity by 20 per cent., with very little additional effort, if they wished to do so and could be induced to appreciate the advantages which would result. With a view to clarifying the position, Mr. Mann presented two films.

Film Show

The first of these films was concerned with the broad issue of relationships between management and employees; arguments for and against increased productivity were presented before a judge with the viewers as the jury. Some of the main points that are commonly made against increased productivity were raised and effectively countered, largely by "witnesses supporting the prosecution." The second film, "New Methods for Old," related to the developments arising from the Brassfoundry Productivity Team's Report, and was a more practical example of the methods being adopted to increase production.

A very lively discussion followed the presentation of these films, particularly as related to the difficulties in obtaining co-operation from labour. Not all the difficulties, however, were with labour, and it was agreed managements must take their share of responsibility for the difficulties experienced. Mr. Mann said that the response on Tyneside to the efforts of the local committee of the British Productivity Council had been relatively poor; he put this down to an attitude of mind and felt sure it could be overcome if the will to improve became firmly established in the minds of both management and employees. The meeting concluded with a hearty vote of thanks to Mr. Mann.

Australia (Victoria)

The second annual convention of the Australia (Victoria) branch was held in the Royal Melbourne Technical College in November. It was opened by the Hon. A. E. Shephard, the Minister of Education, who gave an address. This was followed by the annual general meeting and the presidential address.

The afternoon session of November 10 was opened with a paper and film by Mr. S. Taylor on the "Production of Heavy Steel Castings." This being the official Exchange Paper from the parent body. It was followed by a paper on the "Effect of Sodium Additions on the Gas Content of Aluminium/Silicon Alloys" by Mr. R. H. Dyke. The evening session was devoted to the hearing of papers from Mr. W. H. Baxter on the "Grey Iron Foundry of the Geelong Works of the International Harvester Company" and by Mr. W. O. Adams, F.R.S.A., on "A New Method of Casting Bronze Pump-impellers." This session concluded with an open discussion on "Gas Porosity in Light-section Cast Iron."

The whole of the Thursday was devoted to a visit to Ballarat, where the works of Ronaldson Brothers and the Tippett Foundry were visited. On Friday, two papers were presented. The first, an official paper from the Western Australian Foundry and Metals Institute, was by Mr. S. Harrison on "Foundry Economics" and the second, sponsored by the Institute of Australian Foundrymen, N.S.W. Division, by P. Markwell on the "ρH of Australian Moulding Sands." The convention closed with the annual banquet, held at Ascot House.

Failure to Fence Machinery

A fine of £15 was imposed on Rubery Owen & Company, Limited, Darlaston (Staffs), at Wednesbury Stipendiary Court for failing to fence machinery which caused injury to James Hammond. The prosecution alleged that Hammond, who was collecting swarf, had his back to a machine when he was caught by a revolving stock bar which protruded 11 in. over the normal length. Hammond was lifted off the ground, his clothes were ripped off, and he sustained broken ribs and injury to his spine.

Mr. E. H. Kenshall, representing the company, which pleaded guilty, said that a skilled operator in charge of the machine should have cut the stock bar in two. He added that there was a full-time organization for ensuring as far as possible the safety of workpeople.

Award for Hand Injury

At Stourbridge (Worcs) County Court, Ivan Korobka, of Lea Road, Wolverhampton, was the plaintiff in an action brought against Stewarts and Lloyds, Limited, Halesowen. The case arose out of an accident in May, 1953, in which Korobka sustained an injury to his right hand while operating a lathe.

The plaintiff claimed £163 5s. 6d. as damages against the firm, which, he alleged, had been negligent in not securely fencing a dangerous machine. The defendants claimed that the plaintiff was negligent in that he attempted to adjust the guard while the machine was in motion and that he took no reasonable steps to prevent injury.

Judge T. W. Langman awarded Korobka £60 general damages and £13 5s. special damages, with costs.

Correspondence

INDUCTION HARDENING

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—We noted with interest the article by W. Malmberg in your issue of October 28, on the subject of " Induction Hardening Slideways on Cast-iron Lathe Beds."

We have been carrying out, in our Burton-on-Trent research and development department, an exhaustive series of experiments on parallel lines to those described in the article, and we must agree entirely with the findings of Mr. Malmberg, both as regards the metallurgical effects and the methods employed to progressively heat the lathe-bed slideways. In our experiments however, we feel that we have progressed somewhat further than the paper indicates, as we have been able to reduce the distortion of a 7-ft. lathe bed to a maximum of 0.003 to 0.004 in. Obviously, any decrease in distortion is of immense value in reducing the cost of the final grinding operations.

One interesting technique which we have developed is that of continuously heating through a fluid medium, so that quenching is virtually instantaneous on a band immediately behind the inductor. By this method we have been able to utilize a softer quench medium and keep down the surface temperature of the slideway, thus enabling the phosphorus content to be higher than would otherwise be permissible for good surface finish. With a normal low-phosphorus iron, using the technique referred to above, we have been able to consistently realize hardness values between 60 and 80 Shore.

Following the successful conclusion of a campaign of experiments, we are now in a position to make plant suitable for this process, utilizing normal h.-f. induction-heating equipment as a basis, and in fact we are working at this moment with a large machine-tool manufacturer on the production problems involved.—Yours, etc.,

R. P. GARDNER,
Electric Furnace Company, Limited.

Netherby, 161, Queens Road,
Weybridge,
Surrey.
December 16, 1954.

U.S. Credit for Spanish Steelworks

The Export-Import Bank in Washington has announced that it has granted a credit not exceeding $1,200,000 to the Lewis machinery division of Blaw-Knox, Limited, and Westinghouse Electric International Company to assist them in selling U.S. machinery, equipment, and services to a Spanish firm, Manufacturas Metalicas Madrilenas S.A. The equipment will be used in the construction of a new steel-finishing and fabricating plant situated near Madrid.

The Lewis foundry division of Blaw-Knox will supply a hot-rolling mill, a finishing mill, a skin-pass mill, spare rolls, and various spare parts, while Westinghouse is to purchase, for the account of the Spanish firm, a tube mill, a roll-grinding machine, and auxiliary equipment. It is stated that this loan from a Government agency will assist suppliers of American equipment and services in making about $2,000,000 in foreign sales.

More Excess-price Allegations

Metal deals involving more than £1,100 in which amounts over the ceiling price for scrap iron are alleged to have been paid or received were described to Brierley Hill magistrates on December 14.

Mr. C. H. Lewes, prosecuting for the Ministry of Supply, said that some scrap dealers had taken advantage of an acute shortage of metal by overcharging and a few local firms had risked their reputations by taking part in the schemes. In the first case, the proprietor of a foundry firm appeared on nine charges of buying scrap at more than the permitted price between March, 1952, and January, 1953. He was committed for trial at Staffordshire Quarter Sessions.

It was said he had paid £527 14s. 3d. extra on nine deliveries of scrap totalling 308 tons—an excess of 32s. to 34s. a ton. To cover up the overcharge he had been issued with two invoices for each delivery; the first of these carried details of the load, with the permitted maximum price. On the second, which bore the same index number plus a suffix letter, was a fictitious quantity and price to make up the extra charge. Mr. Lewes said it was not known who thought up the scheme, but, whoever, it was, the foundryman risked his reputation by taking part. In court, the foundry proprietor said he would plead not guilty and reserve his defence.

Three similar charges against a Dudley foundry involved an excess payment of £102. Mr. Scott gave evidence that invoices issued by the supplying firm showed an overcharge of about 27s. per ton. These cases were sent for trial, Mr. F. Blennerhassett, defending, intimating that the plea would be one of not guilty.

In another case, a scrap dealer appeared on 33 charges of supplying scrap iron at more than the permitted price. He is alleged to have overcharged a total of £548 on deliveries of metal to Midland foundries.

Mr. Lewes said the Ministry of Supply claimed that the dealer had made an illegal charge for haulage on each of 33 deliveries, the excess varying from 15s. to 25s. per ton.

On being committed for trial at Staffordshire Quarter Sessions, the dealer said he would plead not guilty and reserved his defence.

Technological Education in Glasgow

When MR. WOODBURN asked the Secretary of State for Scotland if he was prepared to consider, as part of the Government's proposed developments in education, the development of Glasgow Technical College into a technological university, MR. JAMES STUART said that the Government believed that the progress of higher technological education in Glasgow could best be served if the college and the university worked out a relationship which, without in any way hampering the development of the college, would enable their work to be co-ordinated.

The Government therefore invited the two institutions to enter into discussions with a view to evolving a scheme which would be satisfactory to both parties.

THE INCREASE in approvals for new factory building in Scotland this year gave ground for hoping that there would be increased industrial expansion there next year, said the President of the Board of Trade.

American Shell-moulding Practice*

By W. F. Bye

Adaptability to mechanization is a key advantage of the shell-moulding process. Mechanization has made it possible to produce castings of superior quality at a high rate with comparatively little skill. This combination, plus advantages of the process, has in a few years pushed shell moulding from the status of an interesting experiment to an accepted production method (see appendices, below).

Most companies took their first look at shell moulding in the laboratory or a corner of the foundry with simple equipment. From this start, foundrymen designed equipment to meet their individual needs. Now machinery producers have made available new automatic and semi-automatic equipment to form, cure and eject shell moulds. Two types of automatic machines—single- and multi-station—are used. In the multi-station machine, designed for high production, the pattern moves through the various steps on a turntable. The equipment usually takes four or more patterns and uses dutch ovens for heating. With a multi-station machine, 250 or more shells per hour can be produced. Three to four men may be required for the operation, and high production runs are needed to secure maximum economy.

With a single-station machine, the sequence of operations is generally automatic except for periodic addition of mix to the hopper and removal of shells. Shells produced usually contain cope and drag sections. By installing an assembly device near the machine, one man can produce about 40 finished moulds per hour.

For efficient high-volume production, several other types of equipment are needed. These include: Enclosed hoppers for sand and resin; automatic weighing and mixing in dust-tight compartments; a means of conveying ingredients to the mixing stations and the mix to the shell-moulding machine; automatic shell-ejection devices.

Stations are also needed for assembling moulds. Provision must be made for placing the moulds in flasks and backing them up with shot or sand. Pouring stations should be close to metal charging to minimize materials handling.

Equipment that will shake out the casting and return the back-up material is needed. Provision should be made for cooling and cleaning back-up material before re-use. A conveyor system reduces materials handling between production of the shell and automatic shake-out of the casting. Means of conveying and cooling the castings to an area for cleaning and heat-treating speeds the operation.

Assembly

To produce a finished shell-moulded casting, the cope and drag shell sections are assembled, and the mould placed in a flask and backed up with shot. The metal is poured, cooled and the rough casting shaken out. After the gates and sprues are removed, the castings are heat-treated and cleaned.

* Extracted from an article in *Iron Age* entitled "Key Shell Mold Advantages". The Author is senior product estimator, Spicer Manufacturing Division of Dana Corporation, Toledo, U.S.A.

In appendices, the author lists the following guides to aid in the selection of jobs suitable for shell-moulding and advantages to be expected:—

Jobs Suitable for Shell Moulding

A job that is adaptable to shell moulding will usually have one or more of the following characteristics:—

1. Requires a high degree of finish.
2. Requires intricate detail.
3. Replaces a job that would need a large amount of draft if cast by any other method.
4. Cannot normally be made by conventional green-sand methods.
5. Requires much machining.
6. Has holes or openings that can be incorporated in the mould halves.

Shell-moulding Advantages

Castings have superior finish—in the range of 125 micro-inches.

Tolerances can be held between 0.002 and 0.005 in. per inch along the mould face.

Castings have better internal structure, less porosity.

Sections as thin as 0.010 in. can be accurately cast without warpage.

Draft can be decreased to from 0.5 to 1 deg.

Sprues and gates are often smaller, requiring less metal to be poured.

Foundry sand usage is decreased approximately 90 per cent.

Hot-tearing and cracking of casting surfaces are largely eliminated.

Floor-space requirements may be substantially reduced.

Less time is required in shake-out, removal of sprue and gates, and in cleaning.

Machining may be substantially reduced or eliminated.

Moulds can be made in advance and stored for future use.

Less-skilled operators may be used to produce moulds.

American Shell-moulding Practice

Cope and drag shells may be assembled by glueing, nailing, bolting, clipping, etc. The method of assembly should be rapid, assure a firm bond, and provide sufficient contact between surfaces to prevent excessive finning.

Many foundrymen now use low-cost, fast-drying glues for shell assembly. The shallow glue tanks are inexpensive, and a firm bond is obtained. The operator is able to run a shell-moulding machine and assemble shells at the same time. Unfortunately, moisture present in the air occasionally causes poor bonding, resulting in excessive flash.

Clips, staples and C-clamps are often used. While a flash fin may be obtained on the parting line, it can usually be held thin enough for easy removal. Nails and bolts tend to warp the mould and result in hard-to-remove flash.

Most recently, a resin mixture has been used for bonding. The shells are sprayed with a resin mix and hot pressed together to form an adhesion similar to the bond in the shell itself. This development may produce one of the best methods of assembly to date.

Assembled moulds are usually placed in a flask and backed up with a fine steel shot or coarse sand of about 50 A.F.S. The back-up material should be strong enough to prevent warpage or collapse of the mould before the metal solidifies. It should also be sufficiently permeable to allow escape of gases. Some vibration is needed to settle the back-up and obtain a firm support. Special vibrating tables are available and should be used in production.

No Difference in Pouring

Steel shot provides a firmer, more permeable back-up material than sand, and some foundrymen report castings backed with steel shot have higher strength and superior internal structure. Use of a back-up material has disadvantages. It must be cleaned and cooled before re-use, making conveyors and other equipment necessary.

Castings to 25 lb. and larger have been poured successfully without a back-up material. The assembled moulds are mounted in unsupported steel frames. If shell moulds are to be poured without back-up, a thicker shell and higher resin content are needed.

There is no essential difference in pouring green-sand and shell-moulded castings. Ladle pouring is used and both types of castings may be poured at the same time. Pouring by this method has advantages. Shell moulds have better insulation characteristics and can be cast at lower temperature.

This temperature differential can be of the order of 50 deg. to 100 deg. C. less than required for green-sand pouring. If increased over 100 deg. C. excessive scrap will occur. This advantage makes metal melting time faster and decreases heating cost. When foundries feel justified in melting metal separately for shell moulding, fuel will be saved.

Since shell moulds can be handled and moved so easily, they can be taken to the metal for pouring. Normally, metal is taken to the moulds in green-sand casting because moulds are bulky and present a problem in materials handling. By moving the shell moulds to a location convenient for pouring, much handling of molten metal can be eliminated.

Shake-out is much easier with shell moulds. Little vibration is required and the casting comes out almost free of sand. Virtually no cleaning is required, scale is eliminated, and adhering sand can be easily removed. The time of cleaning is substantially reduced. Smaller gates and sprues are easier to handle and can be removed in less time. In many cases, heat-treating is not needed, since the skin hardness normally obtained is eliminated.

Shell-moulded castings must be handled with more care. Usually the casting has been made with tolerances of a few thousandths of an inch compared with the normal $\frac{1}{16}$ in. or more. Rough handling, severe heat-treating or excessive shot-blasting will eliminate many process advantages.

Range

Almost all metals can be cast in shell moulds, including grey, nodular, pearlitic, malleable and Meehanite irons; aluminium alloys; alloy-, carbon- and stainless-steels; and certain types of brass, bronze and magnesium. The best results have been obtained with the aluminium alloys and irons. The castings are cleaner, shake out more easily and have better surface finish. Successful castings have been made in other higher strength alloys. Casting qualities may not be so good as with aluminium and iron but these materials still show advantages over green-sand methods.

Most difficulty has been encountered in pouring high-lead and tin alloys, low-carbon steels and magnesium alloys. The high-lead brasses and high-tin bronzes tend to sweat when poured. Low-carbon steels have generally produced poor castings, but some jobs are beginning to show good results. Magnesium alloys tend to burn in pouring, but by incorporating a mixture of sulphur and potassium fluoborate in the sand/resin mix, some success has been reported. Industry will not derive the maximum benefits from shell moulding until methods of making cores are improved.

Two Ways to Make Cores

Shell cores can be produced by blowing or dumping a sand/resin mix into a heated corebox. The corebox must have a means of ejecting the cured core. In blowing, the mix is injected into the hot corebox at about 30 lb. per sq. in. for 6 to 10 sec. Pressure is removed and the loose mix falls away. In dumping, as in making moulds, the mix falls on to the hot surface, but with a slightly longer time cycle. The core is then cured, ejected, and used. Dumping has proved more successful in making shell cores. Resin tends to break away from the sand under the pressure of blowing, resulting in weak spots, rough finish, and breakage. While dumping produces a good core, its applications are limited. It is very difficult to produce a sudden decrease in diameter by this method since the mix will not bond upwards. It is possible to dump in sections, but the ridges produced are reflected in the casting.

Railway Freight-charges Scheme

The British Transport Commission have now completed a draft of the Railway Freight Maximum Charges Scheme, as required by the Transport Act, 1953, and are now engaged in a series of consultations with important bodies of transport users upon the substance of this draft. Thereafter the final draft scheme will be submitted to the Transport Tribunal for a full inquiry. At this public inquiry all bodies representative of railway users and other interested parties are entitled to be heard.

Terms of Reference

Any charges scheme submitted to the Tribunal must, under the terms of the 1953 Act, confine itself solely to establishing maximum charges. In this it differs fundamentally from the old schemes, which purported to fix standard charges. That is, the new scheme will not settle the actual charges which will normally be paid. These will be a matter for competitive quotation beneath the maxima, and for commercial negotiation between the parties concerned. Failing agreement as regards any particular traffic the consignor may, provided that other means of transport cannot be used, appeal to the Tribunal to fix an actual rate. All the maximum charges scheme can do, therefore, is to provide a broad framework within which the railways will be free to exercise commercial enterprise and play their full part in the national transport economy.

It likewise follows from the Act, and from the competitive conditions created by the Act, that the ground plan of any such framework should attempt to reflect, if only in the most general terms, those major factors of cost which inevitably will influence the fixing of actual rates in the changed circumstances of the future. Notwithstanding the limited significance of the maximum charges in practice, therefore, the scheme must endeavour to distinguish between them according to the weight and "loadability" of the consignment, and must provide for the pronounced "tapering" of cost by distance, as well as for the fact that the smallest unit of haulage cost is the wagon.

In this it again differs from the schemes devised in the past for fixing standard charges. These involved a complex classification of many thousands of different commodities according to the value of the commodity, and were founded on the principle of averaging cost over the whole traffic field, the contribution of each type of traffic being fixed according to its ability to pay; the more valuable the commodity, the higher the rate for conveyance, irrespective of the actual cost of handling it. Such a system ignores the many differences as between one route and another, between one transit and another, or between the regular customer and the casual user. It could only succeed under conditions of near-monopoly and is quite incompatible with a competitive regime. Indeed, it has long since broken down, and the percentage of traffic still passing at "standard" rates is quite small.

New Basis

Competition compels the Commission to complete the abandonment of an archaic system of charges based on the value of goods and on the averaging of costs on a national scale, in favour of charges based on two main considerations—(*a*) what the particular job or group of jobs will cost to perform, and (*b*) what the competitive market will bear. The actual railway charges must be flexible enough to meet the varied and changing circumstances of traffic, operation and market; it follows that the statutory maximum charges to be fixed under the formal scheme in due course must be high enough to cover the wide ranges of working costs for different traffics and transits, and to allow ample room for normal commercial agreements. In conclusion, it will be no part of the scheme to bring about a general increase in the freight revenues of the Commission.

Indian Steel Plant Proposals

Proposals made by Mr. B. M. Birla, president of the Federation of Indian Chambers of Commerce, for a 1,000,000-ton steel plant, to be financed jointly by United Kingdom and Indian capital, and for a 200,000-ton pig-iron plant at Durgapur were reported recently to have been rejected by the Indian Government.

Under the proposal for the steel project U.K. interests would have supplied about £45,000,000 worth of equipment on a credit basis, repayable over at least 12 years. The total cost of the plant was estimated at £70,000,000, excluding new townships, railway extensions, etc.

The proposed pig-iron scheme was intended to produce about 280,000 tons a year. The capital outlay was put at £7,500,000.

Later, Mr. K. C. Reddy, the Indian Minister for Production, said that the plan for a steel plant proposed by British and Indian businessmen was still under consideration by the Government. He told the House of the People that the plan's acceptance or rejection did not arise, as the whole question was being considered in the context of the Government's industrial policy resolution in 1948. This stipulated, he said, that certain industries, including steel, should be under Government control.

Imperial College's New Rector

The governing body of the Imperial College of Science and Technology has appointed Prof. Reginald Patrick Linstead, F.R.S., to succeed the late Sir Roderic Hill as Rector of the College. Prof. Linstead, who is 52, will take up the appointment on January 1.

He was appointed Professor of Organic Chemistry and Director of the Organic Chemistry Laboratories at the Imperial College of Science and Technology in 1949, and in 1953 he became Dean of the Royal College of Science. From 1945 to 1949 Prof. Linstead was Director of the Chemical Research Laboratory of the Department of Scientific and Industrial Research.

After having been a research chemist with the Anglo-Persian Oil Company, Limited, he was Demonstrator and later Lecturer in Organic Chemistry at the Imperial College from 1929 to 1938, in which year he became Firth Professor of Chemistry at Sheffield University. From 1939 to 1942 Prof. Linstead was Professor of Organic Chemistry at Harvard University; he relinquished that appointment to become Deputy Director of Scientific Research at the Ministry of Supply, an appointment he held until 1945.

VULCAN FOUNDRY, LIMITED—With effect from January 1, Mr. Godfrey Rigby, general manager, and Mr. Kenneth F. Suggett, who is handing over his position as secretary to Mr. A. R. Adams, have been appointed directors. Mr. R. G. de Quetteville is resigning from the board and, because of ill-health, Mr. F. S. Whalley is resigning from the board and from the board of the subsidiary, Robert Stephenson & Hawthorns, Limited.

Personal

MR. ERIC H. UNDERWOOD has been appointed director of public relations of the Atomic Energy Authority.

MR. R. ROBINSON has been appointed chief accountant of the Butterley Company, Limited. Previously he was assistant secretary.

COL. SIR JAMES G. B. BEAZLEY, who is 70, is not to seek re-election as chairman of the Mersey Docks and Harbour Board.

MR. A. G. FORMOY, the training officer to the Council of Ironfoundry Associations, has resigned his position as from December 15.

MR. ERNEST A. FREEMAN, who is 22, has received award of the Sunderland Forge & Engineering Company, Limited, for the company's outstanding apprentice.

MR. F. W. NIELD, secretary of the Lancashire branch of the Institute of British Foundrymen, announces his change of address to " Brentwood," Kinders, Greenfield, near Oldham.

CHAMBERLIN & HILL, LIMITED, of Chuckery Foundry, Walsall, announce that MR. M. M. HALLETT, formerly with the Sheepbridge Group, has been appointed managing director.

MR. J. F. GARDNER has resigned from the Board of John E. Moore, Limited, metal refiners of Yeadon, Yorkshire, and no longer takes any part in the company's business.

MR. JAMES STEEL, sales and service director of Steels Engineering Products, Limited, Sunderland, has returned to England after a seven weeks' business tour of the Middle East.

MR. H. P. B. COX has been appointed secretary of the Industrial and Commercial Finance Corporation in succession to Mr. G. S. STONE, who will continue as assistant general manager.

MR. J. K. MCKENDRICK, secretary of the Tyne Improvement Commission, has, in addition, been appointed to the post of general manager, which has been vacant since the retirement of Mr. N. M. Hood in April.

MR. A. R. PAGE, who was until recently on the technical sales staff of the Incandescent Heat Company, Limited, Smethwick, has been appointed sales manager of the Franklin Furnace Company, Limited, Sparkhill, Birmingham, 11.

MR. HILTON HUTCHINSON, manager of the Howdon repair yard of the Tyne Improvement Commission, is to retire, having been at the yard for more than 40 years. He was assistant manager for 10 years and has been manager for the past 18 years.

MR. A. S. PEACOCK, of Babcock & Wilcox, Limited, engineers and boilermakers, of London, E.C.4, has been appointed manager for Latin-America, with general responsibility for the company's business there, including factory development in Brazil and co-ordination of policy.

MR. HAMISH LITHGOW, general manager of the Wallsend shipyard of Swan, Hunter, & Wigham Richardson, Limited, is retiring at the end of the month after 49 years with the company. He was appointed assistant yard manager in 1911, yard manager in 1921, and general manager five years ago.

MR. C. A. M. GRAY, manager of Harland & Wolff, Limited, North Woolwich, has been appointed chairman of the River Thames Dry Dock Proprietors and Shiprepairers Association for the second successive year. The vice-chairman is MR. T. G. W. WATSON, manager of R. & H. Green & Silley Weir, Limited.

MR. GODFREY RIGBY, general manager of the Vulcan Foundry, Limited, and Mr. Kenneth F. Suggett, secretary, have been appointed directors of the company as from January 1. MR. SUGGETT will relinquish his position as secretary and will be succeeded by MR. A. R. ADAMS. MR. R. G. DE QUETTEVILLE will resign from the Board at the end of the month.

The council of the Society of Consulting Marine Engineers and Ship Surveyors has recommended the nomination of MR. JOHN E. CHURCH, of Cardiff, as president in succession to MR. G. KNOWLES, of Liverpool. Mr. EDMUND P. WILSON, of Newcastle-upon-Tyne, has been nominated senior vice-president in succession to Mr. Church, and MR. ALEX ADAMSON, of Leith, junior vice-president in succession to Mr. Wilson.

MR. J. F. LOCKWOOD, who is chairman and managing director of Henry Simon, Limited, flour-milling equipment manufacturers, of Cheadle Heath, Stockport, has been appointed to succeed SIR ALEXANDER AIKMAN as chairman of Electric & Musical Industries, Limited. Sir Alexander, who is remaining a member of the E.M.I. board, is also a director of several other companies, including Dunlop Rubber Company, Limited.

SUCCEEDING MR. D. T. HOLLINGSWORTH, who was recently appointed to the Board of the company, as chief engineer of British Insulated Callender's Cables, Limited, is MR. P. R. DUNN, who became deputy chief engineer in 1952. A past-president of the North-Western branch of the Association of Mining Electrical and Mechanical Engineers and of the Manchester and District branch of the Institute of Welding, he is the present chairman of the Mersey and North Wales centre of the Institution of Electrical Engineers.

MR. D. N. de MATTOS has been appointed sub-district manager of the Bristol office of the British Thomson-Houston Company, Limited. He had been engaged in commercial engineering duties on the London office staff since 1952. MR. B. BARTON has left the B.T.H. Manchester office to take up a commercial engineering appointment at Crown House, London, while Mr. E. R. SEADON, who for six years has been on the lighting-engineering staff of the company, has been posted to the industrial sales division of the London office as a commercial engineer.

Obituary

MR. JOSEPH NELSON MARSHALL, who would have completed 50 years' service with the Park Foundry Company, Belper, on January 1, has died at the age of 62.

MR. WILFRED HASTIE, chairman of Manlove Alliott & Company, Limited, ironfounders and manufacturing engineers, Nottingham, has died at the age of 68. He had been associated with the company for 48 years.

HERBERT BOWLING, who died on December 2 at the age of 68, joined the family business of John Bowling & Company, Limited, ironfounders, of Cyclops Foundry, Leeds, 3, at the age of 16. After two years with the Widnes Foundry Company, Limited, gaining further experience in the making of the heaviest type of work, he returned to the business founded by his father in 1877 and was elected a director in 1917.

Importance of Sound Delivery Dates

Machinery and electrical apparatus manufacturers would be wise to make strenuous efforts to improve delivery times. Although the industries have expanded considerably in recent years and there has been an increasing oversea demand for their products, uncertain dates of delivery and deferred pricing through insertion of the "price ruling" clause in contracts have militated against still greater exports. As the Evan Stuart Macpherson Trade Mission to South Africa and Rhodesia under the auspices of the Manchester Chamber of Commerce pointed out, with engineering products it would be to manufacturers' advantage if they quoted a longer delivery date and kept to it rather than let the customer down by non-delivery at the promised time.

The importance of complying with delivery dates was strongly emphasized by Mr. Gerhardt Jooste, High Commissioner for South Africa in the United Kingdom, when he spoke at the annual luncheon of the British Engineers' Association. Mr. Jooste referred to the large two-way trade now being carried on between Britain and South Africa. In 1953, South African exports to the U.K. totalled £100,000,000, while Britain exported to the Union some £160,000,000 worth of goods. A number of large industrial undertakings which had hitherto curtailed the value of imports into South Africa were now nearing completion and it was not expected that there would be any further reduction in the gross value of the Union's imports.

Electrical and mechanical engineering exports to South Africa had increased from £33,000,000 in 1940 to £48,000,000 in 1953, Mr. Jooste continued. The easing of import controls in South Africa coupled with the maintainence of such controls and their possible extension in other markets might even make the Union the best outlet for British engineering manufacturers in 1955.

Measuring London Smoke Pollution

An observation station for measuring the smoke and sulphur dioxide pollution in the London atmosphere has been established at the Science Museum, South Kensington, by co-operation with the Fuel Research Station of the Department of Scientific and Industrial Research. The station is one of a number that are being established to permit a more detailed examination of atmospheric pollution in London and elsewhere. The sampling equipment is displayed as a working exhibit in the meteorology gallery.

The smoke particles are captured on filter paper through which air is drawn from just above museum roof level by means of a small electric pump. As a result, a grey stain appears on the filter paper, the intensity of which is a measure of the degree of smoke pollution. The same air is bubbled through a weak solution of hydrogen peroxide where the atmospheric sulphur dioxide is dissolved to form an acid solution, the strength of which is measured by standard chemical methods. Observations of smoke and sulphur dioxide pollution are made daily by a member of the museum's staff and reported to the Fuel Research Station, which is in charge of the investigation. The hours of opening of the observation station are 10 a.m. to 6 p.m. on weekdays and 2.30 to 6 p.m. on Sundays; admission is free.

Quality in British Shipbuilding

British shipbuilders have for many months been "under fire" from owners, who repeatedly complain of delivery delays and unpredictable prices. But to Mr. M. M. Xylas, chairman and managing director of Faros Shipping Company, Limited, London, these drawbacks are offset by the traditional quality of British work. At the launch from the South Shields yard of John Readhead & Sons, Limited, of the 10,700-tons dw. cargo steamer Anax for the Anax Shipping Company, of Panama, which is managed by his company, Mr. Xylas said that he, his principals, and his company remained steadfast and unshaken in their belief and confidence in British shipbuilding, despite all temptations and incentives for building abroad.

Mr. Xylas, who is Greek, said that, so far as quality was concerned, he had only praise to bestow upon the builders, but with regard to delivery and cost he could not express the same satisfaction, because the launching, as well as the eventual delivery, had been delayed by about eight months. The cost of the ship was also going to be very high, much higher than his company could reasonably have expected or thought about when the order was placed about three years ago.

Speaking after the launching, Mr. G. H. R. Towers, managing director of John Readhead, said that since the ship was contracted for in November, 1951, there had been no fewer than five national increases in wages, four increases in the price of steel, and innumerable increases in other commodities. He was happy to announce that Mr. Xylas had placed a further new ship, which would give the yard work until March, 1957.

Referring to the new order, Mr. Xylas added that he was very glad because he thought the quality of the work would be much better and would compensate for the much cheaper prices one could get abroad.

Loans for Small Manufacturers

Short-term loans from the Government at a low rate of interest to promote productive efficiency are being received by small manufacturers in many parts of the country. The source of the loans is the Revolving Fund for Industry established as part of the Conditional Aid programme. The fund made £700,000 available to industry and has been operating since August, 1953. Loans totalling about half the fund have been issued or are now under negotiation.

The first repayments will begin to come in over the next few months, and as further loans are made the fund will thus "revolve" in a continuous cycle of loan and repayment. In this way a relatively small amount of money will be enabled over a period to help a large number of manufacturers to put more up-to-date techniques and equipment into use without waiting to build up their reserves first.

The Revolving Fund for Industry is administered by the Board of Trade with the help of an independent advisory committee. The Board is open to receive further applications from manufacturers who need assistance in putting into effect projects falling within the scope of the fund. Details can be obtained from the Board of Trade, I.M.2 Division (Revolving Fund for Industry), Horse Guards Avenue, London, S.W.1.

GENERAL ELECTRIC COMPANY, LIMITED have opened new premises in Wellington Street, Leeds. Mr. D. Bellamy, O.B.E., D.L., chairman of the Yorkshire Electricity Board, performed the opening ceremony.

Company Meeting

POLYGRAM CASTING COMPANY, LIMITED

The Future of Shell Moulding

EXTRACT FROM CHAIRMAN'S SPEECH

The annual general meeting of Polygram Casting Company, Limited, was held at the company's London offices at Terminal House, Grosvenor Gardens, S.W.1, on Tuesday, December 21, 1954.

The Chairman, LORD TREFGARNE, dealt with the accounts and stated that after seven years of patient work and heavy development expenditure the company had begun to earn moderate profits. He said the future of the company and its subsidiaries was wrapped up with the shell mould and coremaking process.

He thought shareholders would like him to define the policy of the company in that field.

Polygram Casting Company, Limited, introduced the shell mould and coremaking process to Britain. The company was established in co-operation with Johannes Croning, the inventor of the original process. Herr Croning's inventions if made between September 3, 1938, and December 31, 1945, were forfeited to the Allies by post-war legislation. Polygram's patent rights concern inventions made since December 31, 1945. These valuable inventions are available to firms in the foundry industry who purchase Polygram equipment; and, at low cost, to firms who do not wish to purchase Polygram products. This is the company's considered policy.

The main purposes of the company are:—

(1) To supply mechanized equipment and materials to the foundry trade at home and abroad for use in the shell mould and coremaking process.

(2) To instruct and assist foundries in the productive use of that plant in the shell mould process generally.

(3) To give a protective licence to foundries embarking on shell moulding, irrespective of whether they wish to use Polygram machines or materials.

Polygram's Equipment and Service

Polygram has developed the most complete and efficient range of shell and coremaking plant in the world. No other company, in the U.S.A., Germany, or the U.K., can offer such a complete range of hand-operated and automatic mould making machines, coremaking machines and mould closing machines.

Moreover, the user of Polygram machines has the unique advantage that he can also purchase Polygram materials which are used with the machines and receive from Polygram the technical data to enable him to operate machines and materials in combination, thus avoiding long and costly research of his own.

A large number of leading foundries have wisely adopted this method of commencing shell moulding.

Polygram offers this Instructional Service Agreement for £750 per annum, with an additional £250 per annum, less tax, for those who wish to take the Polygram Licence Agreement. Polygram does not regard the instructional licence or the supply of resin binder as profit-making activities. It is content to break even on these, regarding them as a convenience to its customers and an adjunct to its main business of equipment manufacturers.

There is no foundation whatever for suggestions, which some rivals have made, that Polygram is restricting the development of shell moulding in the foundries. A recent attempt to form a Shell Mould Association seemed to be founded on this misconception.

Polygram's aim and interest is for the widest possible use of the process in the foundry trade and, in fact, Polygram has now demonstrated its machines and techniques to over 400 foundry companies. The company's patents department is always ready to give the fullest information and guidance to inquirers, but Polygram machines can be purchased without the necessity of any licence agreement whatsoever.

The Future of Shell Moulding

Although Polygram has helped to keep shell moulding and coremaking in the U.K. technically in the forefront, it is well known that shell moulding has been more widely adopted in the United States than in Britain. This is partly because higher wages in the U.S.A. make its relatively more advantageous. But skilled moulders and coremakers are quite highly paid in the U.K. and in some districts are becoming increasingly scarce. The cost advantages of shell mould and shell coremaking, in the proper field, are becoming better understood every year; and there can be no doubt that a substantial proportion of sand moulding and an even higher proportion of conventional coremaking are being displaced by shell techniques.

The future of the art and science is therefore assured and the best informed authorities in the industry regard it as common prudence—to put it no higher—to change over a part of their production, the proportion depending on the nature of the products, to shell.

In this development, Polygram's aim is to serve the British foundry industry by providing it with the best equipment obtainable and assisting the users to make the best use of that equipment. Polygram have reason to know that their policy, consistently followed, is earning the goodwill of the foundry industry.

News in Brief

THE 3,000 employees of the International Harvesters Company, Limited, Doncaster, recently shared a bonus of £29,000.

SIR MILES THOMAS, chairman of B.O.A.C., has accepted an invitation to open the third National Factory-equipment Exhibition at Earls Court on March 28 next.

ONE HUNDRED AND ONE retired employees of Charles Roberts & Company, Limited (Railway Wagon Works), Horbury Junction, near Wakefield, have received Christmas gifts of £3 each.

OVER 80 MEMBERS of the Northern Council of the National Association of Baths Superintendents paid a visit on December 15 to the works of Thomas Broadbent and Sons, Limited, engineers and founders, Central Ironworks, Huddersfield.

CASH AWARDS totalling £65 were presented on December 17 to ten apprentices of W. & T. Avery, Limited, Smethwick, who have passed their technical school examinations. The presentations were made at a ceremony in the Boardroom by the works manager, Mr. F. S. Eaton.

HERBERT MORRIS, LIMITED, engineers, of Loughborough, have more than 200 apprentices under training. Dr. D. J. Lysaght, principal of Loughborough College, presented prizes and awards to successful students, at the annual presentation, held in the firm's sports and social club in Market Street, Loughborough, recently.

ABOUT EIGHTY EMPLOYEES and friends attended the Christmas party of Erewash Foundry, which was held in the clubhouse, Stanton. Among those present were Mr. Earnshaw (foundries manager); Mr. H. Pinchin (Erewash foundry manager); Mr. Millington (works manager), and Mr. Millar, formerly of the Erewash foundry, now the manager at Holwell.

WHEN A FOUNDRY LABOURER was charged before Sheffield magistrates on Friday, December 17, with rate arrears of £26 16s. 6d., a wage statement recorded him as having earned £175 14s. 7d. in 13 weeks—an average of £13 10s. 4d. each week. His rate was 7s. 5d. a week, with 1s. 1d. water rent He was required to pay £4 on the following day and £2 a week afterwards.

FOLLOWING A GOOD YEAR and also because of the withdrawal of the excess-profits levy, the engineering and foundry firm of Newton Chambers & Company, Limited, of Thorncliffe Works (South Yorkshire), have given a special bonus to their 4,000 employees. Each worker having not less than a year's service received the equivalent of one and a half week's average earnings.

SAMUEL OSBORN & COMPANY, LIMITED, Clyde Steel Works, Sheffield, held their annual presentation of awards to apprentices on December 17. More than 50 apprentices gained special awards, and special prizes for outstanding results in further education were gained by Colin Wade, metallurgical laboratory, Hugh Sykes, melting plant, John Curtis, general office, and Eric Roebuck, drawing office.

THE RANGE of "Polford" foundry plant and equipment is now being manufactured by the Polford Engineering Company, Limited, Heaton Junction, Newcastle-upon-Tyne, 6, whose sole selling agents are Thos. W. Ward, Limited, Albion Works, Sheffield. The directors of the new company are:—Mr. C. W. Coan, chairman; Mr. G. Pollock, M.I.B.F.; Mr. S. K. Edwards; and Mr. G. R. Chetwynd, M.P.

HADFIELDS, LIMITED, Tinsley steel works, Sheffield, a firm with 6,000 employees, presented every worker with a food voucher for £1 10s. as a Christmas present. These were considered a more direct tribute to the family spirit than extra money in the pay packet which would have been subject to tax. Fifteen employees of the firm were presented each with an electric clock on December 18, in recognition of their 25 years' service.

RADIVISOR PARENT, LIMITED, 1, Stanhope Street, London, N.W.1, have recently installed at the Luton factory of Vauxhall Motors, Limited, electronic equipment for maintaining shop temperature in cold weather. By confining incoming and outgoing traffic to two doors only, and automatically ensuring that both are never open together, in association with other controlled apparatus, an equable shop temperature has been achieved.

EXPORTS from the United Kingdom last month, provisionally estimated by the Board of Trade at £196,500,000, were the lowest since February, 1953, and they compare with £240,000,000 in November of last year. Last month's imports, on the other hand, at £333,800,000, were the highest since early 1952, and compare with little more than £228,000,000 in the previous month, while in November, 1953, imports were little more than £272,000,000.

THOS. FIRTH & JOHN BROWN, LIMITED, steel manufacturers, Atlas Steel Works, Sheffield, held the annual prize-giving for employee-trainees on December 17. Eighty-nine apprentices received prizes presented by Dr. G. Lawton, principal of Sheffield College of Commerce and Technology. Dr. C. Sykes, managing director presented the Apprentice Cup—for the most successful apprentice of the year—to Roy Allen, and a replica of the cup to Clive Mellor, last year's winner.

AMONG new Justices of the Peace appointed at Sheffield are: Mr. William Jenkins Gibson, a director of Hadfields, Limited; Mr. Robert Jardine, chairman and managing director of Sheffield Smelting Company, Limited, and chairman of Lees & Saunders, Limited, Birmingham; Mr. William George Pallett, managing director of Laycock Engineering Company, Limited, and Sir Harold Ernest West, managing director of Newton, Chambers and Company, Limited.

BIRLEC, LIMITED, announce that Mr. E. H. Ball, a director of Associated Electrical Industries, Limited, and managing director of British Thomson-Houston Company, Limited, has been elected chairman of the Board. Also elected: Mr. W. W. Vinsen, director of manufacture, and Mr. E. S. Little, comptroller and secretary. These three new directors join the existing executive directors, Mr. George P. Tinker (managing) Mr. T. G. Tanner and Mr. J. H. Crossley.

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION have appointed an industrial development committee "to consider the steps to be taken to foster and develop the use of electricity in industry." At its first meeting at 2, Savoy Hill, London, on December 15, the committee elected Mr. L. Howles, C.B.E., F.R.S.A., chairman of the South Wales Electricity Board, as chairman, and Mr. J. F. Smith, B.SC., M.I.E.E., chief commercial officer, South Wales Electricity Board, as vice-chairman.

THE PRESERVATION of machinery and tools showing the development of Sheffield industries and trades has been suggested by the Sheffield Junior Chamber of Commerce. They have suggested that the City Council might provide rent free storage for examples of ancient

News in Brief

machinery and tools until an industrial museum is available. Mr. H. E. McGee, the president, writes in the Chamber's magazine that such action would prevent the tools from decay and stimulate interest in the implements and products of past ages.

R. J. RICHARDSON & SONS, LIMITED, of Commercial Street, Birmingham, 1, announce that they have acquired the whole of the share capital of Rowland Priest, Limited, of Lower High Street, Cradley Heath, who manufacture pulley blocks, winches, hoists, hydraulic and other jacks. Mr. B. Millward and Mr. M. P. Millward will remain directors and Col. C. A. B. Lindop, O.B.E., D.L., J.P., and Mr. F. J. Pettifer, Mr. R. J. Richardson and Mr. W. C. Sproson will join the Rowland Priest Board, with Col. C. A. B. Lindop as chairman.

SIR CLAUDE COREA, High Commissioner for Ceylon, accompanied by Lady Corea, his son, and his niece, toured the Brush works at Loughborough on December 17. He drove an 87-ton Diesel/electric locomotive for half-a-mile. It was the fifteenth of 25 locomotives ordered for the Ceylon Government Railways at a cost of £1,000,000. After luncheon, the High Commissioner was presented with an inscribed cigarette box by Mr. H. Tattersfield, general manager and director of the works. Sir Ronald Matthews, chairman of the Brush Group, accompanied the party.

KIRKSTALL FORGE ENGINEERING COMPANY, LIMITED, Leeds, were given judgment with costs by Mr. Justice Havers, at West Riding Assizes on December 17, in a case where a claim for damages was brought by a radial driller. He was John Summerton, of St. James Walk, Horsforth, and he claimed for damages as a result of trapping his left hand on January 15, 1953, while operating a machine. The company had an excellent system of training, said the Judge, and highly skilled men, two of whom had had 44 and 42 years' experience respectively, were available to advise. Summerton himself was an excellent workman but his injuries resulted from his own negligence.

THE RECENT INCREASES in pig-iron prices, although regarded as almost inevitable, have increased the difficulties of the ironfounders in Scotland. Together with higher prices for foundry coke they have added a considerable burden to production costs, a serious matter in particular for iron foundries engaged in making castings destined for export markets. Short-time working in foundries for a time recently resulted in some measure from keen competition from overseas competitors and to meet that firms were exhorted to reduce the price of their products, an almost impossible task even before the rise in pig-iron prices. The busier conditions now enjoyed at the Scottish foundries, with the increase in turn-over, are helping a little, however, to solve the problem.

BRITISH EXPORTS of vehicles to South Africa are rising and will continue to rise, according to Mr. Alex Fraser, vice-chairman and managing director of Girling, Limited, Birmingham, who has just returned from an 18,000-mile trip to South Africa. "There are tremendous opportunities out there," he said. "People are now realizing that the small British car can accomplish all that they expect from the larger American car. Girling's own business is rising as a result of the boom in British vehicles. Overall production has risen by about 20 per cent. and the company's factory in South Wales, controlled from Birmingham, is being expanded. It is claimed that the firm's products are being fitted into 52 per cent. of all British cars, 70 per cent. of commercial vehicles and 100 per cent. of the trailers.

TWO COVENTRY POLICE OFFICERS chanced to make a routine call on December 2 at a local scrap-dealer's yard, when four men, including one from Walsall and another from Pelsall, had arrived with a van containing stolen metal, it was alleged at Cannock on December 13. "When the police officers overheard what was being said, they pricked up their ears and asked where the metal had come from," said Mr. A. H. Gregory, prosecuting two scrap-metal dealers. The men were committed on bail to Staffordshire Quarter Sessions, charged with breaking and entering the Norton Canes workshop of J. A. Crabtree & Company, Limited, and stealing £246 worth of phosphor-bronze, brass and copper. One of the men was committed also on a further charge of stealing cakes of gunmetal, value £180, from a compound at James Bridge copper works.

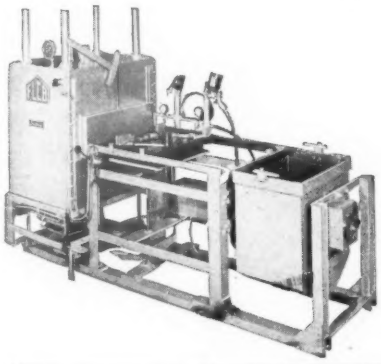
EMPLOYEES at Fisher Foundries, Limited, Birmingham, who share in what the management claim to be the most generous profit-sharing scheme in Midland industry, received their half year's profits at a dinner given by the firm on December 16. Some of the skilled men drew sums which brought their profits for the year up to £154. Mr. Matthew Docker, managing director, who founded the firm more than 40 years ago, introduced the profit-sharing scheme soon after the war. Since then, he says, output has doubled from the same plant and labour force and profits are more than four times as high. Workers are divided into four categories by a small committee of employees. These categories are based not on degrees of skill but on the effort and hard work shown by the men. Individuals in the groups receive one, two, three or four units of profit shares. This year's share-out is the largest to date.

INDUSTRIALISTS affected by labour shortage should consider meeting in regional groups to discuss the idea of taking over between them the workers' hostels now being closed by the Ministry of Labour on economy grounds. Mr. Munro, manager of the Willenhall Employment Exchange, suggested on December 14 at a meeting of the Willenhall Local Employment Committee. On the same day, Lt.-Col. John Parkes told Kidderminster Chamber of Commerce that his firm, Richard Thomas and Baldwins, Limited, was worried about the possible loss of valuable labour if hostels are to be closed. The labour was essential if the firm was to keep up its export production, he said. The Chamber agreed to ask the Midland Regional Board for Industry to discuss the problem as a matter of urgency. It was stressed that the Ministry might consider keeping the hostels open if they could be made self-supporting.

MR. LAWRENCE ROBSON, chairman of Henry Meadows, Limited, Wolverhampton, and chairman of Associated British Engineering, to which the company now belongs, told employees at the annual gathering on December 16 that the company would be trying to enter the railway market at home and abroad with large-capacity horizontal engines. It was also intended to revive the company's interest in the manufacture of gearboxes. Mr. Robson also said that the firm had received an official invitation from the Chinese trading authority to send a representative to China on a trade mission and it was expected that Mr. A. D. MacKay, deputy chairman, would be the man to go. Reviewing the year's trading, Mr. Robson said that orders for the company's main products totalled £3,000,000. The company had introduced a pension scheme for staff and he hoped by March to be able to give workpeople details of a pension scheme.

SHELL MOULDING AT LOW COST

The Shelmolda 'Duplus' is low in first cost, economical to operate and costs little to maintain. Its design is simple and straightforward, yet it has the advantages of more complicated and costly apparatus. Operation is semi-automatic, with all the strenuous work carried out mechanically. The patent oven is thermostatically controlled and gives the machine a proved capacity of 50/60 moulds per hour. Pattern plates measure 24in. by 16in. and the maximum depth of pattern is 5in. Floor space required is 8ft. 6in. by 3ft. 3in. and the machine is operated by one man. Cost of the Shelmolda 'Duplus' is £575; delivery is 8 to 10 weeks.



Shelmolda

DUPLUS

PATENT APPLIED FOR

FAIRBAIRN LAWSON COMBE BARBOUR LTD

LEEDS, ENGLAND. Telephone : Leeds 32041

236'73

Pig-iron and Steel Production

Statistical Summary of October Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in October, and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in October, 1954, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	All comdts.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[2]
1952[3] ..	254	329	323	206	190	228	202	171	29	310	252	683
1953	260	350	323	304	207	237	215	188	18	339	262	962
1954—May ..	261	365	326	306	236	240	231	208	4	375	288	927
June[4]	265	365	328	289	239	240	233	204	4	372	274	1,011
July ..	265	365	328	284	213	227	221	142	4	263	216	1,078
August	265	365	325	266	238	237	227	177	5	326	229	1,128
Sept.[4]	265	365	324	293	231	232	223	212	7	372	292	1,063
Oct. ..	265	365	324	304	237	236	231	210	3	374	—	973

TABLE II.—*Production of Steel Ingots and Castings during October*, 1954.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	3.9	12.8 (basic)	1.8	0.2	17.8	0.9	18.7
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.2	28.5	—	2.1	0.4	30.8	1.4	32.2
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	38.0	—	—	0.1	37.9	0.2	38.1
North-East Coast	1.9	69.7	—	1.3	0.5	71.5	1.9	73.4
Scotland	2.3	41.3	—	1.3	0.7	43.6	2.0	45.6
Staffs., Shrops., Worcs. and Warwick	—	19.1	—	1.2	0.8	19.1	2.0	21.1
S. Wales and Monmouthshire	5.5	73.3	5.7 (basic)	1.2	0.2	85.2	0.7	85.9
Sheffield (incl. small quantity in Manchester) ..	9.7	31.9	—	10.3	0.5	50.4	2.0	52.4
North-West Coast	0.3	1.0	5.2 (acid)	0.5	0.1	7.0	0.1	7.1
Total	20.9	306.7	23.7	19.7	3.5	363.3	11.2	374.5
September, 1954[4]	21.7	303.2	24.6	19.4	3.4	361.4	10.9	372.3
October, 1953	22.5	292.2	17.4	19.0	3.9	343.6	11.4	355.0

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel.*

Product.	1952[3]	1953.	1953.	1954.	
			Sept.[4]	August.	Sept.[4]
Non-alloy steel:					
Ingots, blooms, billets and slabs[5]	4.5	4.7	4.8	3.8	5.2
Heavy rails ..	8.0	8.7	8.6	6.9	9.2
Sleepers, etc. ..	1.8	2.2	1.8	1.1	2.4
Plates, 3 mm. thick and over ..	41.4	46.5	47.9	42.9	49.2
Other rolled prod.	39.0	43.9	47.4	36.2	47.8
Wire rods and other rods, bars coiled	15.9	15.6	15.1	19.8	22.1
Light rolled prod.	46.0	49.3	49.0	38.7	51.3
Bright steel bars ..	6.5	6.7	7.0	4.9	6.7
Hot rolled strip ..	18.8	18.8	19.8	17.2	23.9
Cold rolled strip ..	6.1	5.2	5.5	5.8	7.5
Sheets, incl. coated	31.7	34.1	37.5	29.8	41.1
Tin, terneplate and blackplate ..	16.0	14.9	16.9	12.6	17.4
Steel tubes, pipes	20.1	20.1	21.2	15.9	20.8
Tube, pipe fitgs.	0.4	0.3	0.3	0.3	0.4
Tyres, wheels, axles	3.5	4.4	5.0	3.9	5.1
Forgings (excl. drop forgings) ..	2.8	3.1	2.9	2.1	2.3
Steel castings ..	4.2	4.0	3.8	3.8	4.3
Tool and magnet steel	0.3	0.3	0.3	0.2	0.2
Total	267.0	282.8	294.8	245.9	316.9
Alloy steel	13.4	13.7	13.5	10.7	13.9
Total deliveries from U.K. prod.[6] ..	280.4	296.5	308.3	256.6	330.8
Add: Imported finished steel ..	12.9	6.8	6.3	5.2	5.7
Deduct: Intra-industry conversion[7] ..	42.7	42.6	43.7	33.7	45.6
Total net deliveries of new material ..	250.6	260.7	270.9	228.1	290.9

TABLE IV.—*Production of Pig-iron and Ferro-alloys during October*, 1954.

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	26	—	20.2	23.7	0.4	—	44.3
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire ..	7	—	16.4	—	—	0.9	17.3
Yorkshire (incl. Sheffield, excl. N.E. Coast) ..							
Lincolnshire ..	9	—	33.3	—	—	—	33.3
North-East Coast	22	4.3	47.2	—	—	1.4	52.9
Scotland	9	0.8	16.6	1.8	—	—	19.2
Staffs., Shrops., Worcs., and Warwick ..	7	—	8.3	1.4	—	—	9.7
S. Wales and Monmouthshire	9	5.1	31.4	—	—	—	36.5
North-West Coast	7	16.5	—	—	—	1.0	17.5
Total ..	96	26.7	173.4	26.9	0.4	3.3	230.7
September,[4] 1954	93	27.0	165.9	26.0	0.7	3.2	222.9
October, 1953 ..	106	27.0	161.1	28.6	0.8	4.0	221.5

[1] Weekly average of calendar month.
[2] Stocks mainly ingots and semi-finished at the end of the years and months shown.
[3] Average 53 weeks ended January 1953, all tables.
[4] Five weeks, all tables.
[5] Other than for conversion into any other form of finished steel listed.
[6] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[7] Material for conversion into other products also listed in this table.

FOUNDRY FUMES???

Though corebinder developments have not yet reached the stage where it is possible to guarantee a complete absence of unpleasant casting odours, B.I.P.'s latest synthetic resin corebinder—Beetle W42—represents a very considerable advance in this direction. Developed with the Garrett Report in mind, it combines all the advantages of Beetle W20 with a reduction in casting odour that will be appreciated by foundrymen.

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**Patent Application 32896/58*

Raw Material Markets

Iron and Steel

It is becoming increasingly evident that the aggregate output of the blast furnaces falls short of current demand. Expansion of blast-furnace capacity cannot be hurried, and in the meantime fairly large tonnages of basic pig-iron have been purchased abroad for shipment in the early months of next year. Hematite is not so scarce as the low- and medium-phosphorus grades, but supplies are getting smaller. Current outputs of the foundry and forge irons are more easily obtainable than other irons, but in these grades also there are signs of a shortage developing.

Demands for scrap are on an increasing scale, as available supplies are being depleted faster than new arisings accrue. Particularly is this the case in the supply of machinery and heavy cast-iron scrap, while the lighter grades are also not so plentiful.

Foundry coke is coming forward fairly satisfactorily, and no difficulty is experienced in acquiring adequate supplies of ganister, limestone, and firebricks.

The re-rolling industry is now enjoying a full share in the prosperity of the steel trade. Home demand is brisk and there has recently been such a spate of export orders that the makers of small bars and light sections are now quoting higher prices. It does not appear that this rise has killed the export market, as further inquiries are still circulating. With their mills now working to capacity limits, re-rollers' billet requirements are heavily increased. Supplies are scarce, and may continue so until shipments arrive from the Continent.

Steelmakers' order-books are overweighted to an extent unprecedented since the end of the war. Bookings of finished steel extend over the whole of the first half of next year and the arrangement of satisfactory delivery dates has become one of the principal preoccupations of the makers. In other circumstances, the multiplication of overseas inquiries would warrant expectations of a big expansion of steel exports, but these may have to be limited to ensure adequate supplies to home consumers. Heaviest demand is for sheets, light plates, and medium-sized joists and sections, but the mills engaged on rails, bars, and wire products are also busy.

Non-ferrous Metals

The year is ending with prices of all the non-ferrous metals steady to firm, although tin has lost ground during the course of the present month. Aluminium is tipped for a rise in the New Year, but this is conjecture and there is no indication of the extent of the increase. So far as consumption of non-ferrous metals is concerned, 1954 has shown an all-round increase over 1953 and the outlook at present is that this high rate of use will continue, in spite of relatively high prices in some directions. It is satisfactory that in the case of lead and zinc the backwardation on the market has lessened to vanishing point, but it must be confessed that the risk of widening again persists.

Copper is another story, however, and there is really no indication that we shall be rid of this serious drawback to hedging operations in the near future. At one time this year it seemed as if the backwardation was on the way out, but unfortunately the strikes in August and September reversed this tendency and not many weeks ago we had a spread of nearly £20. Lack of stocks is the main cause of this trouble, but so long as producers can find an outlet for their copper, there is no attraction in selling on the exchange.

Tin presented something of a shock by breaking the £700 level just before Christmas and dropping to around £690. Consumption of this metal is good in the United States and on this side, but the fact is that production has been rising in Malaya, and the surplus tin is being sold on the London market. It is not easy to assess the future price trend, but since is seems as though the tin restriction scheme will not be in operation for another three months or so, we may see a quotation in the neighbourhood of £660. There is a hint that the various producers are pushing up their sales to qualify for a favourable quota under the scheme when it is finally launched.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* December 21, £277 to £279; December 22, £278 to £278 10s.; December 23, £279 to £280; December 24, £279 10s. to £280; December 28, £279 10s. to £280 10s.; December 29, £285 to £286.

Three Months: December 21, £267 10s. to £268; December 22, £267 10s. to £268; December 23, £268 to £268 10s.; December 24, £269 to £269 10s.; December 28, £269 10s. to £270; December 29, £272 10s. to £273 10s.

TIN, Standard—*Cash:* December 21, £691 to £692; December 22, £681 to £682; December 23, £692 to £694; December 24, £690 to £691; December 28, £688 to £689; December 29, £685 to £686.

Three Months: December 21, £691 to £692; December 22, £683 to £684; December 23, £694 to £695; December 24, £691 to £692; December 28, £690 to £691; December 29, £688 to £689.

ZINC—*Second half December:* December 21, £83 5s. to £83 10s.; December 22, £83 to £83 10s.; December 23, £83 10s. to £83 15s.; December 24, £83 10s. to £83 15s.; December 28, £83 5s. to £83 15s.; December 29, £83 to £83 5s.

Second half March: December 21, £82 5s. to £82 10s.; December 22, £82 to £82 5s.; December 23, £82 5s. to £82 7s. 6d.; December 24, £82 to £82 5s.; December 28, £81 5s. to £81 15s.; December 29, £81 15s. to £82.

LEAD—*Second half December:* December 21, £103 15s. to £104; December 22, £104 to £104 5s.; December 23, £105 to £105 5s.; December 24, £104 5s. to £104 10s.; December 28, £104 to £104 5s.; December 29, £104 15s. to £105.

Second half March: December 21, £103 to £103 5s.; December 22, £103 5s. to £103 10s.; December 23, £103 15s. to £104; December 24, £103 10s. to £103 15s.; December 28, £103 to £103 10s.; December 29, £103 5s. to £103 10s.

Death of Mr. G. B. Wallwork

As the JOURNAL goes to Press the news is received of the death on December 22 of GEORGE BERTRAM WALLWORK, formerly a managing director of Henry Wallwork & Company, Limited, Manchester, at the age of 68. He retired from active business in 1952 after some 50 years' service with the company.

THE GOLDEN JUBILEE of the foundation of the Rowhedge Ironworks Company, Limited, Rowhedge, near Colchester (Essex), is being celebrated this year.

THE CONTROLLING INTEREST of Krupps in the Constantin Mine has been sold to the Italian State Railways. The company owned 61 per cent. of the shares and the price is believed to be below £2,500,000. The Italian State Railways have also acquired the minority interest in the coal mine, which is held by a Swiss group. The concern's output is 2,100,000 tons of coal a year and 900,000 tons of coke.

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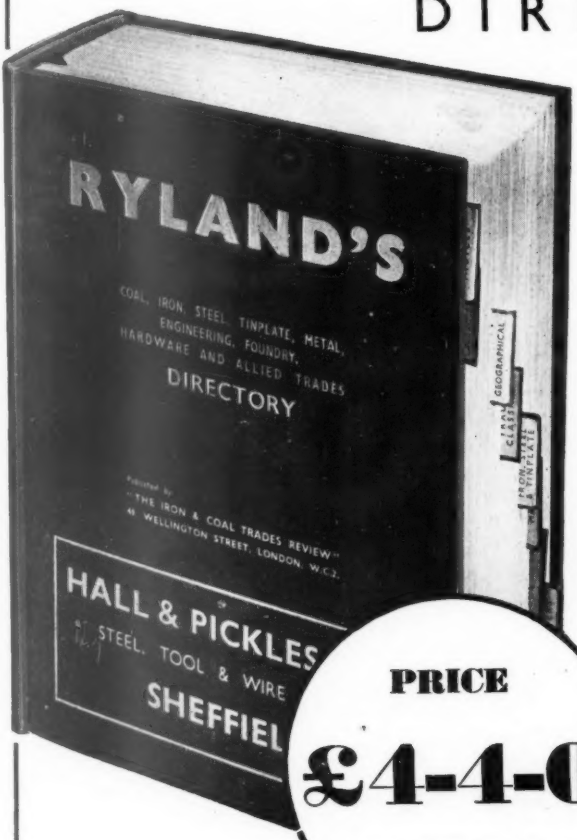

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

December 29, 1954

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £42 0s. 0d., basis 45 per cent. Si, scale 17s. per unit; 70/84 per cent., £65 0s. 0d., basis 75 per cent. Si, scale 18s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £185 0s. 0d. to £195 0s. 0d. per ton; 38/40 per cent., £251 0s. 0d. to £270 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 14s. 3d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 17s. 3d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £75 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £74 0s. 0d. to £76 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 7½d. per lb. Cr; 1 per cent. C,* 1s. 8d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 6½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £54 15s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent. Cr.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d.; hoop and strip, £33 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (hand mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheets, 24 g., £54 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 9d.; nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum, £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £285 0s. 0d. to £286 0s. 0d.; three months, £272 10s. 0d. to £273 10s. 0d.; settlement, £286 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 33d. per lb.; wire, 320s. 6d. per cwt. basis; 20 s.w.g., 351s. 9d. per cwt.

Tin.—Cash, £685 0s. 0d. to £686 0s. 0d.; three months, £688 0s. 0d. to £689 0s. 0d.; settlement, £686 0s. 0d.

Zinc.—Second half December, £83 0s. 0d. to £83 5s. 0d.; second half March, £81 15s. 0d. to £82 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £114 0s. 0d.; rolled zinc (boiler plates), all English destinations, £111 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £96 0s. 0d.

Lead (Refined Pig).—Second half December, £104 15s. 0d. to £105 0s. 0d.; second half March, £103 5s. 0d. to £103 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 26½d. per lb.; rods, drawn, 35½d.; sheets to 10 w.g., 291s. 0d. per cwt.; wire, 33⅝d.; rolled metal, 277s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £187; B6 (85/15), £235; BS249, £190.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £220; HTB2 (30 tons), £230; HTB3 (48 tons), £241.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £235; LG3 (86/7/5/2), £245; G1 (88/10/2/½), £308; (88/10/2/1½), £300.

Phosphor Bronze.—BS1400, PB1 (AID released), £320 per ton.

Phosphor Bronze Strip, etc.—Strip, 409s. 9d. per cwt.; sheets to 10 w.g., 432s. 3d. per cwt.; wire, 50½d. per lb.; rods, 44d.; tubes, 42½d.; chill cast bars: solids 44d., cored 45d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 5½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £110 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £156 0s. 0d.; aluminium bronze (BS1400), AB1, £282; AB2, £293. Solder, brazing, BS1845, 2s. 3d. lb.; granulated, 2s. 6d. lb.

Forthcoming Events

DECEMBER 31

Institution of Mechanical Engineers

"Lost-wax Process of Precision Casting, 1949-1953," J. S. Turnbull," 5.30 p.m. at 1, Birdcage Walk, Westminster, S.W.1.

JANUARY 3

Institute of British Foundrymen

Sheffield branch:—Film: "Britain's Largest Steel Casting," preceded by a short paper by S. Taylor, 7.15 p.m., at the College of Technology, Pond Street.

JANUARY 4

Purchasing Officers' Association

Manchester and district branch:—"Commercial Law as affecting Purchasing," presented by a Barrister-at-Law, 6.30 p.m. at Engineers' Club, Albert Square, Manchester.
Slough and district branch:—"Any Questions," 7.30 p.m., at the Royal Hotel.

JANUARY 5

Institute of British Foundrymen

Burnley section:—"Design and Gating of Various Castings," by W. Collinge, 7.30 p.m., at the Technical College, Ormerod Road.

Institution of Production Engineers

Coventry Graduate: "*Production Panel*":—Discussion on Some Aspects of Production Engineering, 7.15 p.m., Hare and Squirrel Hotel, Cow Lane, Coventry.
Norwich section:—"Fuel Efficiency in the Factory," by E. J. Tickner, B.Sc., 7.30 p.m., at Assembly House, Theatre St., Norwich. Joint meeting with Institute of Cost and Works Accountants.
Nottingham graduate: "Human Aspect in Production Planning and Control," by B. G. L. Jackman, 7 p.m. Victoria Station Hotel, Milton Street.

Purchasing Officers' Association

Coventry branch:—Films: "More than Just Steel," and "Economy through Flexibility," 7.30 p.m. at Wine Lodge Hotel.

Incorporated Plant Engineers

Southampton branch:—"Industrial Instrumentation," by C. M. V. Benwell, 7.30 p.m. at the Polygon Hotel.

JANUARY 6

Institution of Production Engineers

South Wales and Monmouthshire section:—"Standardization in the Process Industries," by E. W. Greensmith, 7 p.m. at South Wales Institute of Engineers, Park Place, Cardiff.
Reading graduates:—"Work Measurement," by Prof. T. V. Matthew, Ph.D., M.Sc., 7.30 p.m., at Great Western Hotel.

Purchasing Officers' Association

North Midlands branch:—"Some Legal Aspects of Purchasing," 7.30 p.m. at Trentham Hotel, North Staffs.

Institute of Metals

Birmingham local section:—Debate: "This House Considers that, at the Present Stage of Industrial Metallurgy, Empirical Methods of Research are more Profitable than those Employing the Fundamental Approach," 6.30 p.m. at James Watt Memorial Institute, Great Charles Street.

JANUARY 7

Purchasing Officers' Association

North Lancs group:—Visit to British Northrop Loom Company Limited. Meet 2.30 p.m. at the works.

Manchester Association of Engineers

"Engineering Practice in the Gas Industry." Paper by T. Andrews, 6.45 p.m., at Engineers' Club, Albert Square.

JANUARY 8

Institute of British Foundrymen

Scottish branch:—"Production and the Foundry," by E. W. Barrell, 3 p.m. at Royal Technical College, Glasgow.
West Riding of Yorkshire branch:—"Production of a Given Casting—V. Metallurgical Aspects," by H. Forrest, 6.30 p.m., at the Technical College, Bradford.

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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY MANAGER, 42, desires change. Southern half of the country preferred. Accustomed to full control. Sound basic training and proved ability in both ferrous and non-ferrous. Good disciplinarian with metallurgical training and fully up to date in mechanisation methods and developments, including shell, etc. Box FM930, FOUNDRY TRADE JOURNAL.

PRODUCTION and WORKS ENGINEER desires appointment, having wide technical experience with Plant, metal patterns, tools, foundry, malleable, grey iron. Box PA973, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (45) free for similar position. Sole control. Life experience in practical and technical. Cupola control, marine, machine tool, sugar refinery, sand control, mechanisation. Guaranteed results. M.I.B.F.—Box FM949, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

VITREOUS ENAMEL.—Young man, with works experience on control, required as TECHNICAL REPRESENTATIVE AND SERVICE ENGINEER. Alternatively, young METALLURGIST for training as above.—Apply Box VE965, FOUNDRY TRADE JOURNAL.

APPLICATIONS are invited from young men with ability and energy for Technical Staff positions in an alloy-steel Foundry using the shell mould and precision casting processes.

Applicants should have had experience in the following fields:—

(1) Either foundry methods, or metallurgy, including H.F. steel melting.
(2) Practical foundry management in a precision casting foundry or a small alloy steel foundry.

Applications to the SECRETARY, Osborn Precision Castings, Ltd., Clyde Steel Works, Sheffield.

PNEULEC will appoint representative to follow Mr. S. E. Smith, who retires July, 1955. Area to be covered is Scotland and N.E. England. Applicants would need (1) to have foundry knowledge with engineering background, (2) to be capable of making proper survey and advise on installation, and (3) provide after sales service. This job calls for appreciation of the opportunities which exist by way of improving working conditions in foundries. PNEULEC LIMITED, Mafeking Road, Smethwick, Nr. Birmingham.

YOUNG man, aged 22/24, with either foundry or pattern shop experience, required for Estimating in Steel Foundry Sales and Estimating Office. Write giving details of experience to Box YM963, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

LABORATORY ASSISTANT (male). Some experience of Foundry or Laboratory work desirable, but not essential. Good pay and prospects.—Apply BRITANNIA IRON & STEEL WORKS, LTD., Bedford.

C. A. PARSONS & CO., LTD., Heaton Works, Newcastle-on-Tyne: ASSISTANT IRON FOUNDRY MANAGER. Applications are invited for the post of Assistant Manager, Foundry Department. The Foundry, which has been recently re-equipped, employs approximately 250 men. It handles iron castings up to 30 tons and non-ferrous castings up to 5 tons for the manufacture of Turbo-Alternator Plant of all sizes up to the largest. A considerable amount of machine moulding is also handled.—Applications, which should be addressed to PERSONNEL MANAGER, should give age, education and experience in chronological order.

PATTERNMAKERS required, used to first-class Wood and Metal work. Excellent conditions, canteen, music while you work, etc., top wages and bonus, by the oldest (85 years) established firm, with the absolute highest reputation. Main suppliers for many years to all firms of importance in the entire country and the finest Plant and Equipment in the world.—Apply WRIGHT & PLATT, LTD., the World's Largest Engineering Patternmakers, Irving Street, Birmingham. Vacancies at Manchester branch. Apply Springfield Lane Works, Salford, 3.

ASSISTANT WORKS MANAGER required, for Company in Yorkshire, who are specialists in Zinc Base Alloy Pressure Die-casting and Aluminium Alloy Gravity Die-casting. Applicant's career must have been founded on die design and die making. Production and labour control experience in the die-casting industry over a number of years absolutely essential.—Replies in confidence, stating salary required, to Box AW957, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE required for Non-ferrous Foundry and Patternshop in Redhill area. State experience, age, and salary required. Applications treated with confidence.—Box RR961, FOUNDRY TRADE JOURNAL.

A VACANCY exists for a FOUNDRY SUPERINTENDENT in a Ferrous and Non-ferrous Foundry in East Anglia. Applications are invited from experienced Foremen who feel they can handle a labour force of 60-70. The position will be progressive as expansion is intended.—Box AV954, FOUNDRY TRADE JOURNAL.

WORKS ENGINEER.—A vacancy exists in a well-established Midland Ironfoundry for a Works Engineer. Applicants should have had experience with all classes of foundry plant, plant records, and factory regulations. Please apply, stating age, experience, and salary required, Box WE953, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FLOOR MOULDERS FOR AUSTRALIA. —Progressive Alloy Steel Foundry in Australia requires two experienced Floor Moulders. Good wages and amenities. Assisted passage paid and accommodation arranged for single men. Foundry Manager at present in England, and will interview.—Please apply Box FM966, FOUNDRY TRADE JOURNAL.

JUNIOR METALLURGIST for H.F. Furnace work in progressive foundry in Australia. Experience in alloy steels and modern foundry techniques essential. Passage paid and accommodation arranged. Foundry Manager at present in England and will interview.—Please apply Box JM967, FOUNDRY TRADE JOURNAL.

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MASTER (TECHNICAL) required to teach FOUNDRY-PRACTICE and associated technical subjects to African boys at Kampala Technical Institute. A well equipped foundry and pattern-making shop is provided and ample opportunities exist for building up a central foundry school. Higher National Certificate or Full Technological City and Guilds required, or Final Certificate with evidence of training in ancillary subjects. Apprenticeship and trade experience essential. Teaching experience and/or Teacher's Certificate desirable. Upper age limit 45. Post permanent and pensionable or on agreement as desired. Home superannuation rights preserved. Salary £762-£1,404, plus 10 per cent. non-pensionable cost-of-living allowance. Quarters at low rental. Free passages. Generous home leave. Tour of service, 30-36 months. Low income tax.—Applicants should write for further particulars and application forms to the DIRECTOR OF RECRUITMENT (Overseas Service), Colonial Office, Sanctuary Buildings, Great Smith Street, London, S.W.1, quoting BCD 114/9/07.

ASSISTANT METALLURGIST required to supervise metallurgical section of Development Department of a large Steel Foundry and Engineering Works. Good background in ferrous metallography is essential.—Replies, stating age, experience, etc., as well as an indication of salary required to Box AM956, FOUNDRY TRADE JOURNAL.

ARCHITECTURAL Metal Workers and Founders require ASSISTANT MANAGER. Preference given to applicant with several years' experience in Foundry work (ferrous and non-ferrous); practical and theoretical, including estimating. Progressive position to right man. State full particulars where trained, also age, etc.—Box AM940, FOUNDRY TRADE JOURNAL.

FOUNDRY TRADE JOURNAL
EST. 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
VOL. 97
No. 2000
Registered at the G.P.O. as a Newspaper
DECEMBER 30, 1954
Offices: John Adam House, John Adam St., London, W.C.2
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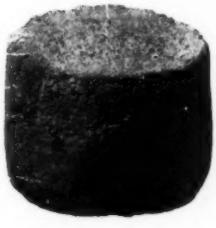

Type of Briquettes	Approximate Total Weight	Weight of Alloying Constituent
Ferro-Silicon, cylindrical in shape:—		
45/50 per cent. Silicon (large size)	5·2 lb.	2 lb.
45/50 per cent. Silicon (small size)	2·6 lb.	1 lb.
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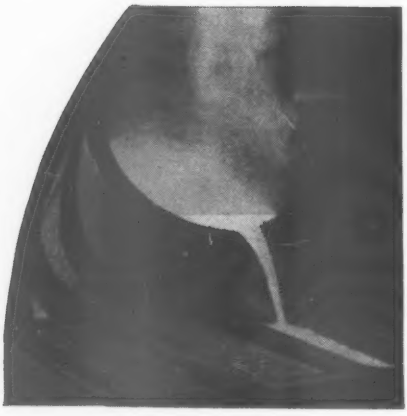

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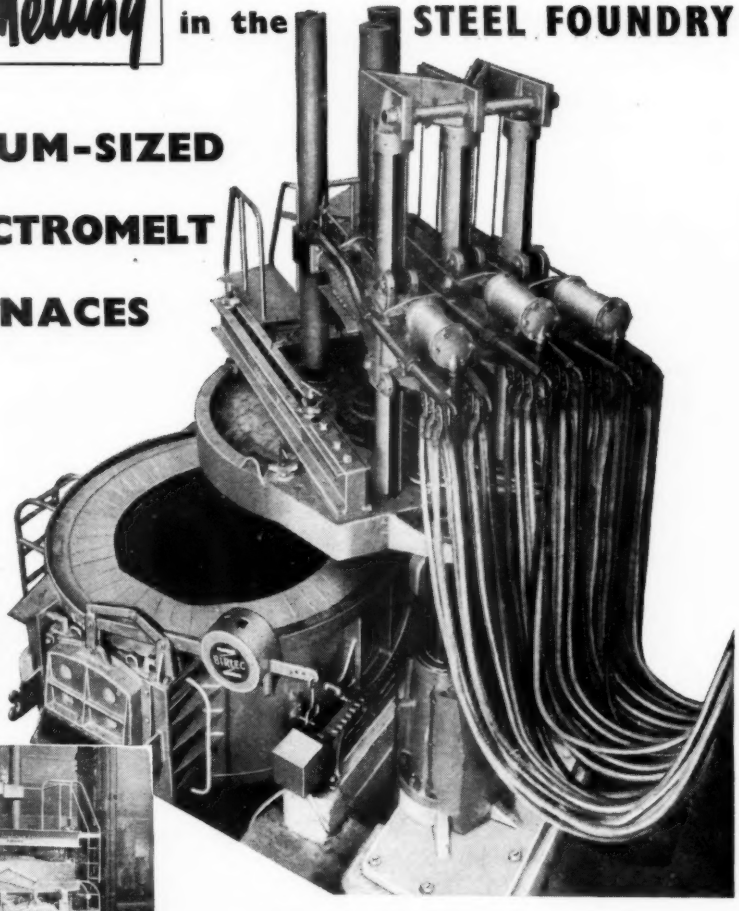
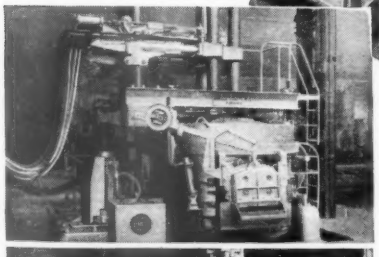
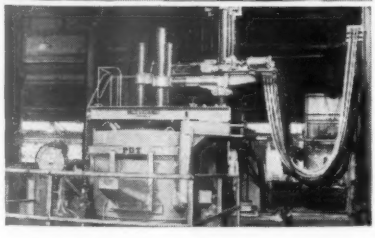


The swing-aside roof of this model QT furnace (3 tons capacity, 1800 kVA) can be plainly seen. This feature is common to all sizes of Birlec Lectromelt furnace and allows top charging with minimum stand-down times. The two smaller illustrations are of the next largest furnace, model PQT: capacity four tons, electrical rating 2000 kVA.





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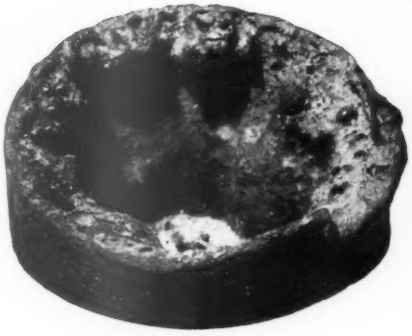

Feeding head to which Feedol has been applied.

Feeding head without use of Feedol.

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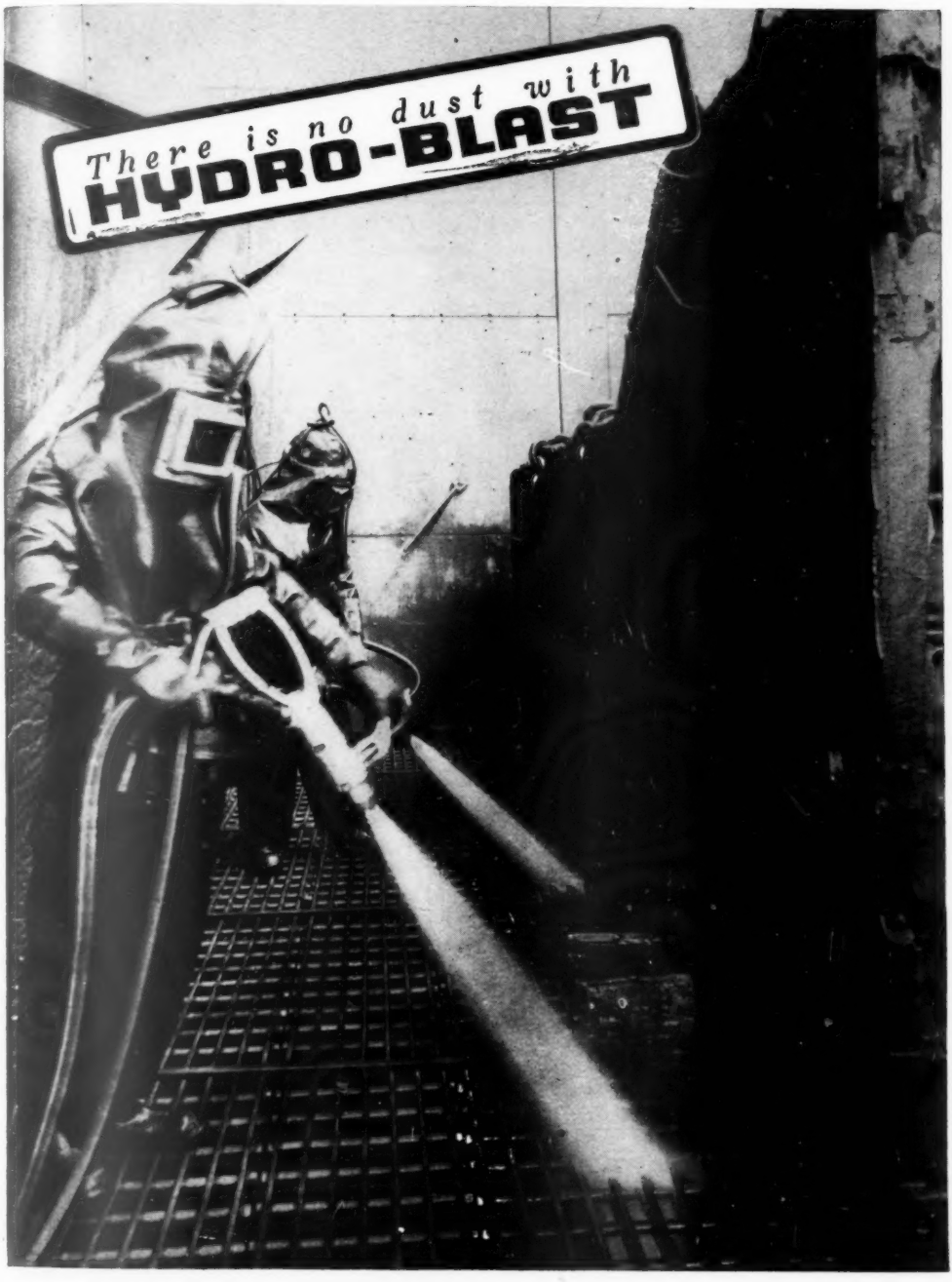

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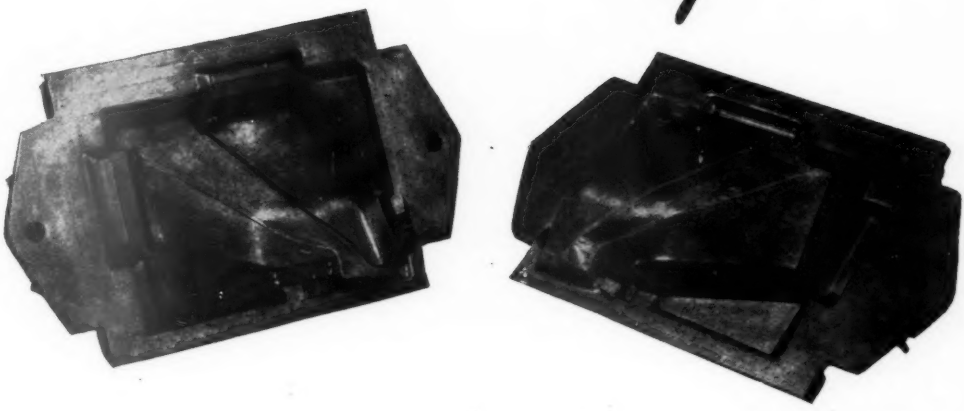

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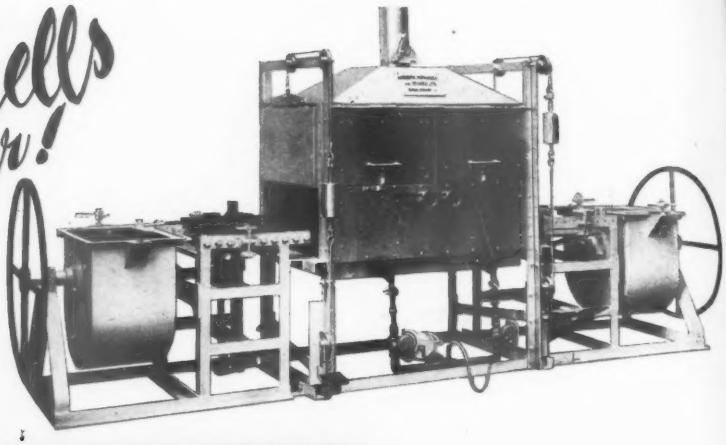

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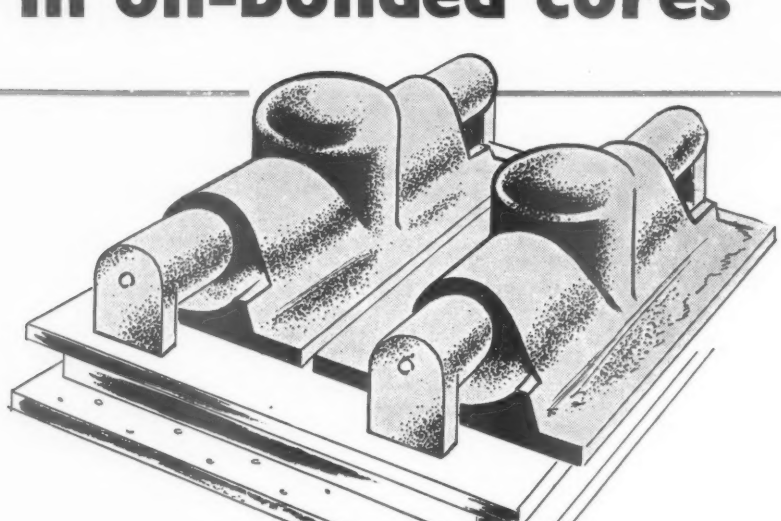

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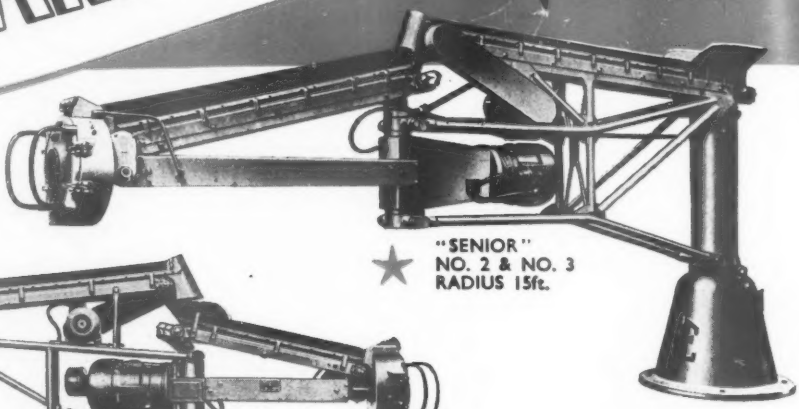

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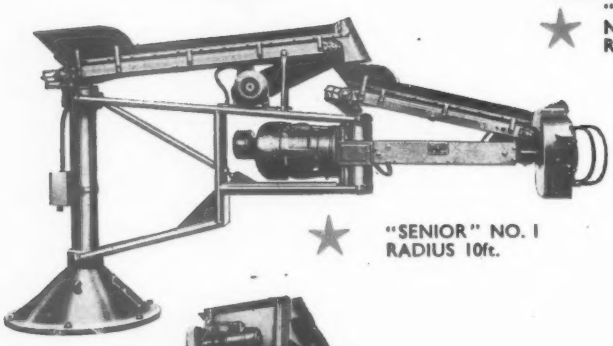

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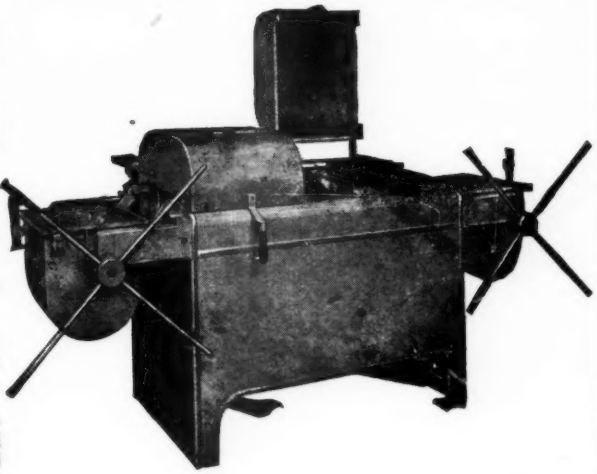

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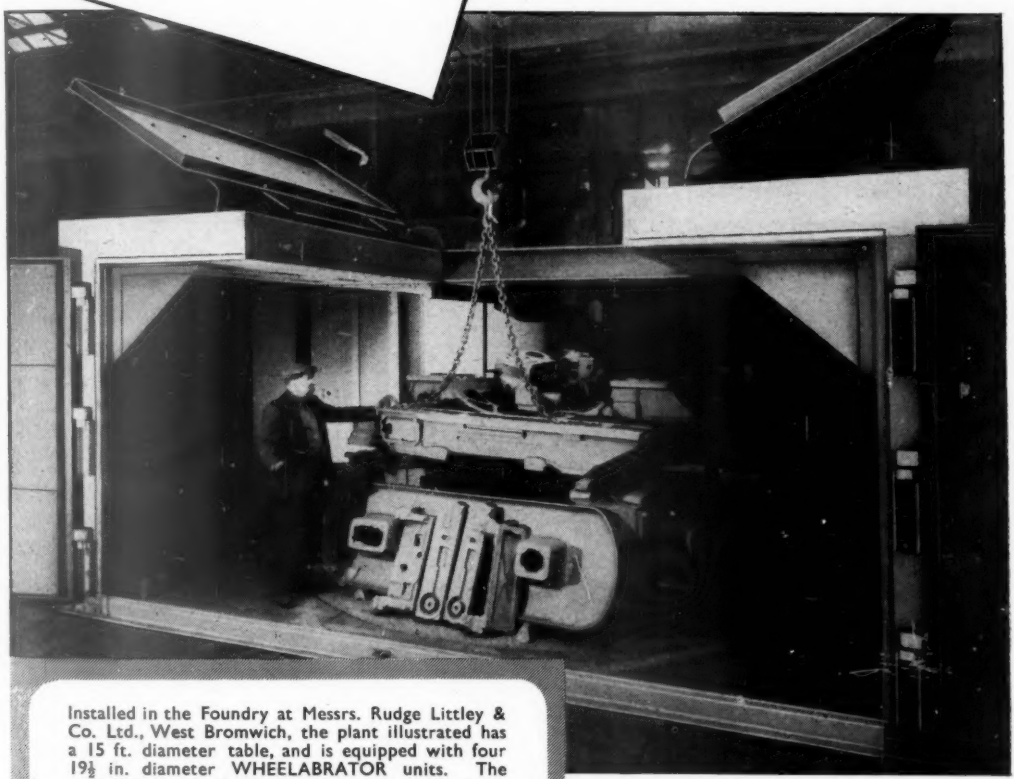

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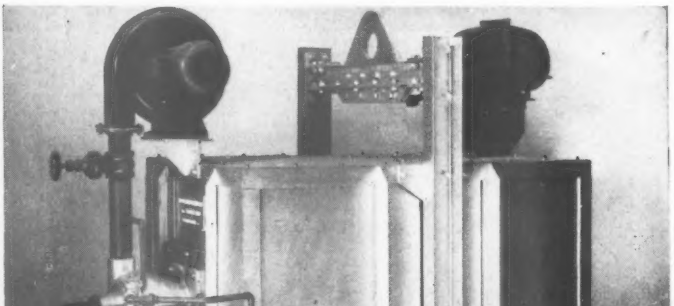

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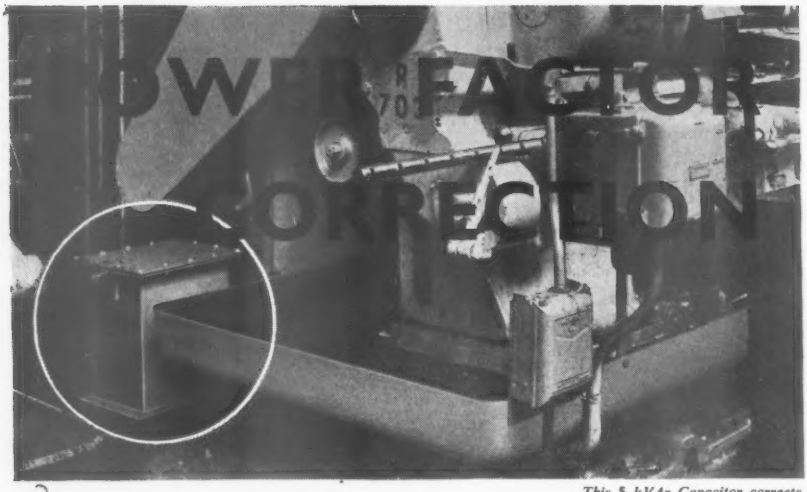

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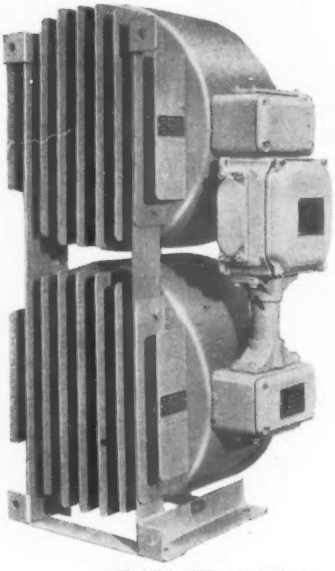

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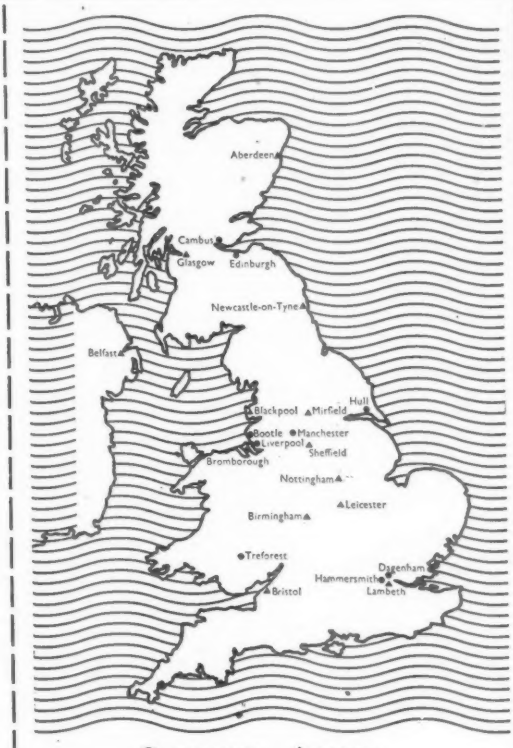

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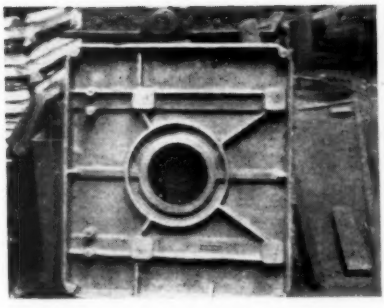

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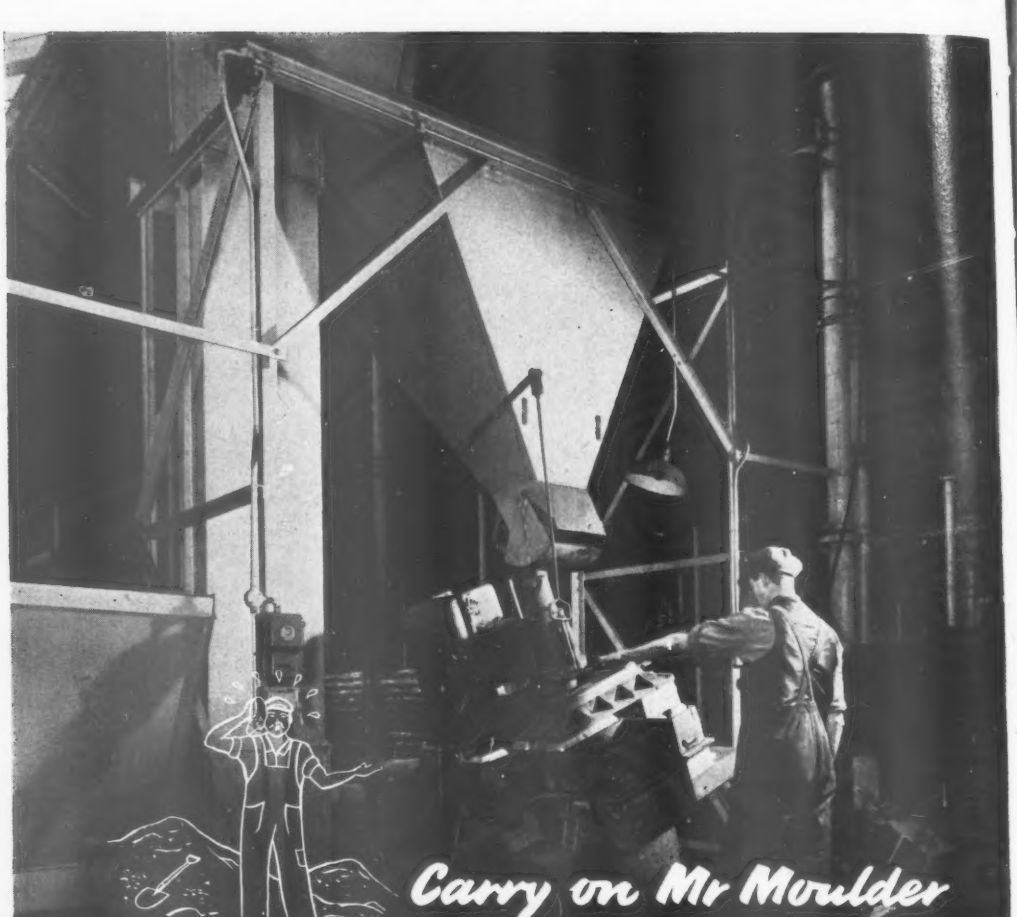

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Single, Double and Multiple Purchase with capacities from ½ to 10 tons.

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Entirely new design, giving two slings in one. Sling legs lock automatically when lifting starts. Saves labour, time and accidents.

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2 cwt. capacity. Turning effort when raising 2 cwt. only 18 lb. Lifting range 5 ft. Total weight 6 lb. No loose chains. All chains are stored within body of hoist whilst raising the load.

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The Machine which will specially appeal to those Foundries whose work necessitates the use of a variety of different size moulding boxes for small and medium size castings.

for High Production

LATEST "PIN POST" TYPE JOLT SQUEEZE MOULDING MACHINE

SPECIAL FEATURES:

- MASSIVE YET SYMMETRICAL CONSTRUCTION.
- JOLT RAM—A REAL BLOW.
- SQUEEZES TO A SET PRESSURE
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- AIR ON OIL CONTROL TO DRAW.
- MECHANISM SAND PROTECTED.
- PATENT AIR-LOADED DISC VALVES.

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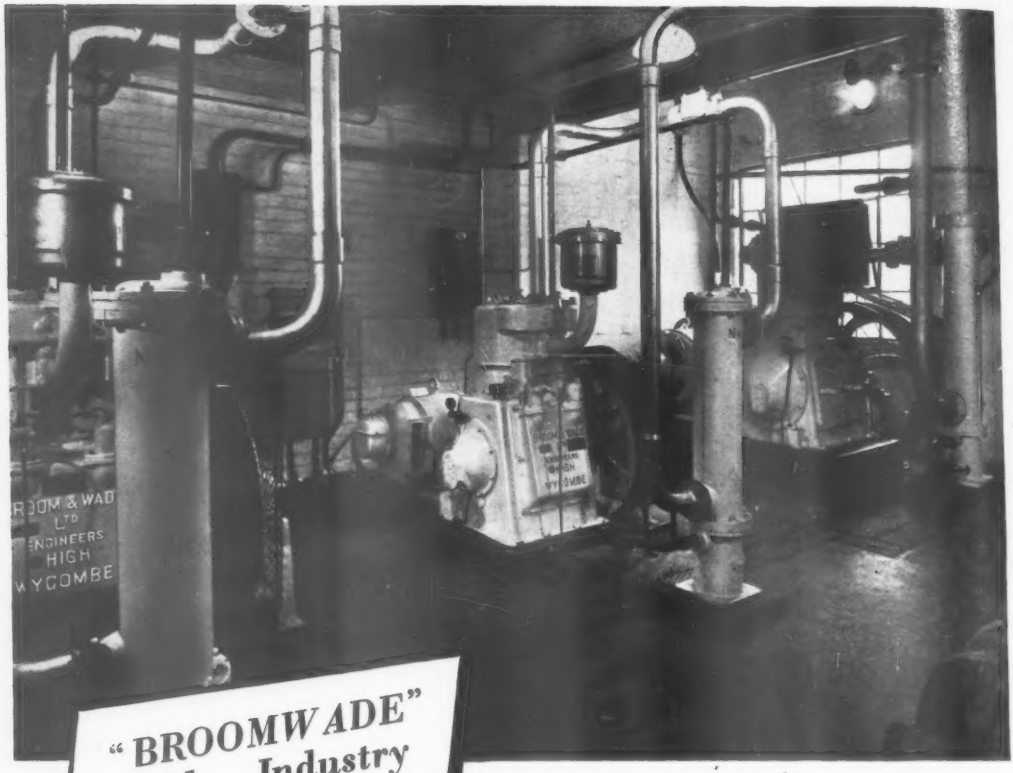

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"BROOMWADE" compressed air plays an important part in the production of iron castings and, in addition, helps cut handling costs at this Staffordshire foundry.

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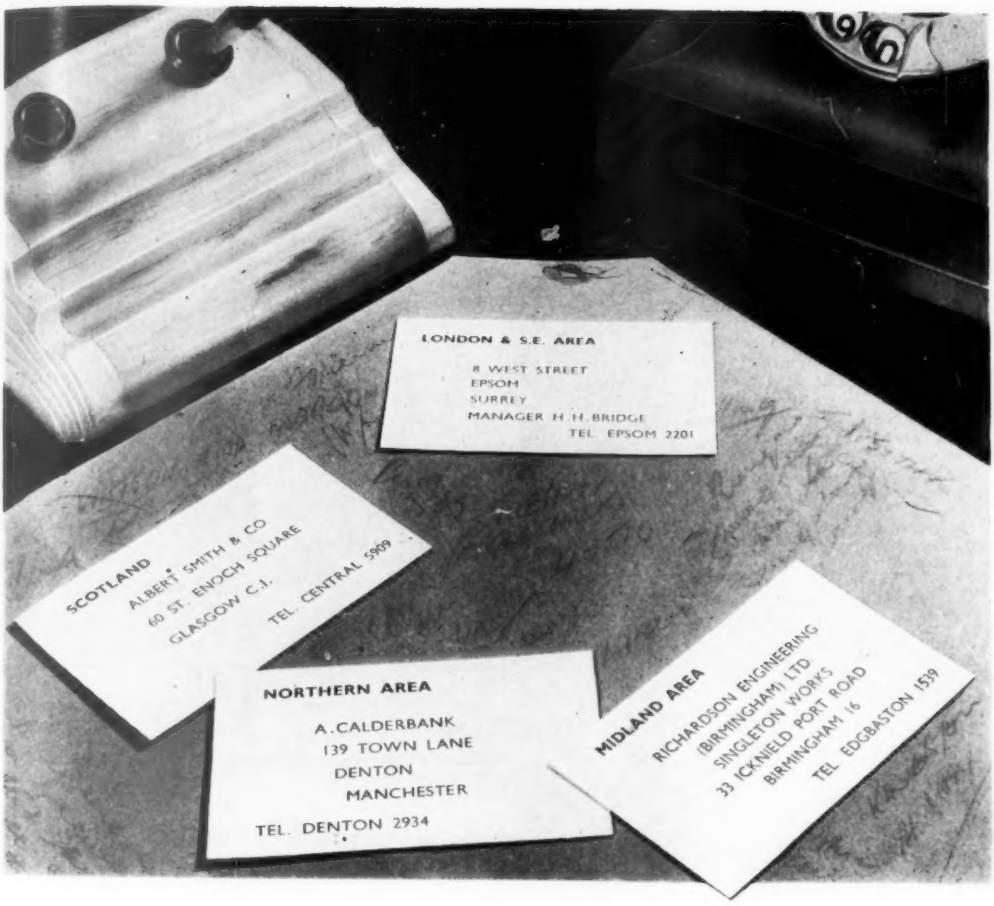

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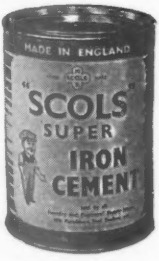

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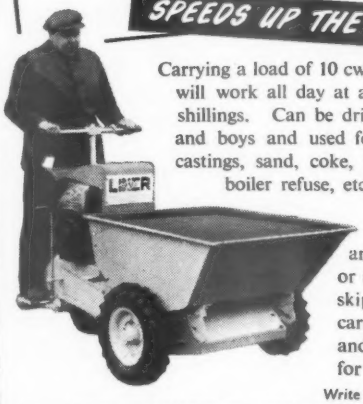

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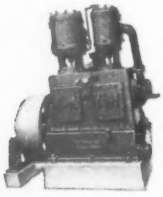

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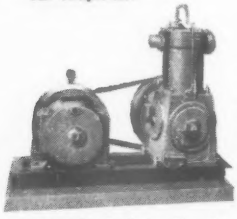

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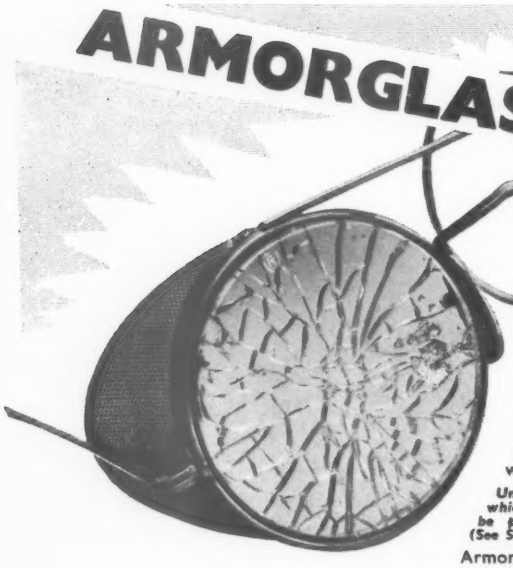

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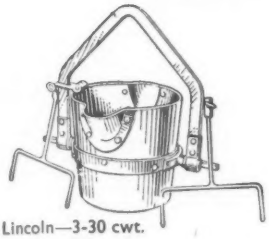
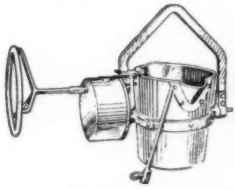


Lincoln—3-30 cwt.



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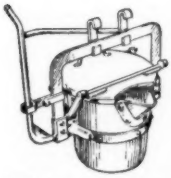
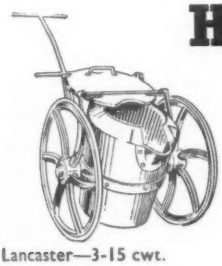


Windsor—1 - 10 cwt.



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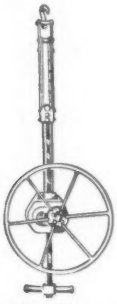

Rutland—S.W.L. 15 cwt.

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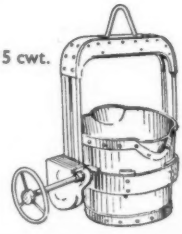
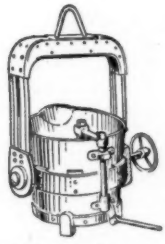


Devon— 10 cwt. - 25 ton.



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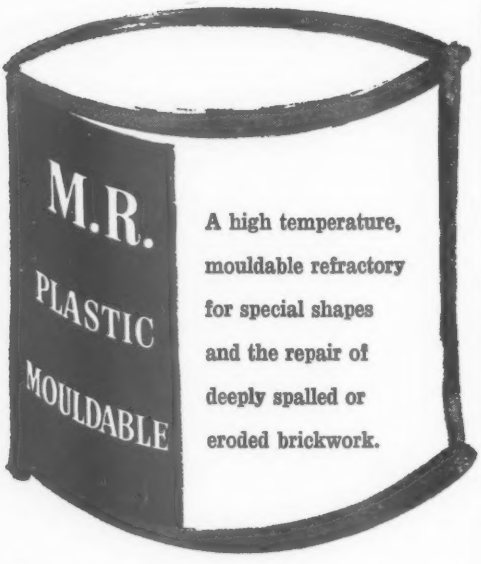
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Silica SiO_2	36%
Ferric Oxide Fe_2O_3	1.3%
Alkalis	1.0%

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Maximum service temperature	1650°C
Shrinkage: Set to dry	less than 0.75%
Dry to 1 hour at 1620°C:	less than 1.00%
Modulus of rupture	
1 hr. at 1000°C	200lb/sq.in.
1 hr. at 1420°C	450lb/sq.in.
1 hr. at 1620°C	750lb/sq.in.

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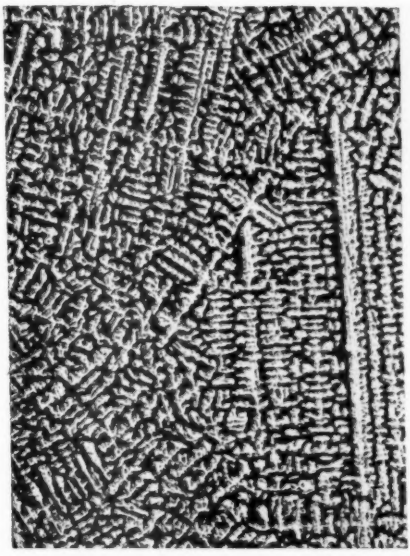

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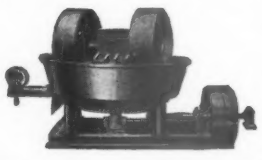

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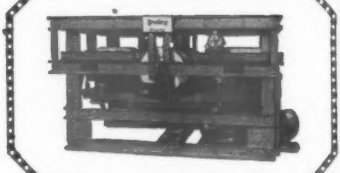

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